Change log
Heathfield Pump Station, Publication 1350

Date	Affected pages	Description of change	Enterer by
Change A			
5/9/05	1-2	Corrected the station address.	B. Thompson
5/9/05	1-4, 1-5, 1-19 and added pages1-20 & 1-22	Added module “Location and Layout of the Eastgate Discharge Structure.” Enlarged the hydraulic profile and	B. Thompson
5/9/05	1-16 – 1-19	Added adition description of the stormwater detention basin, including photos of the inlet and outlet manholes, and a elevation view of the structure.	B. Thompson
5/9/05	9-15, 9-16, & 9-17	Added procedure for hosing out the stormwater detention basin.	B. Thompson

Heathfield Pump Station

Operations Manual

REVIEW DRAFT

December 2004

Change A, May 9, 2005

Department of Natural Resources and Parks
Wastewater Treatment Division
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Seattle, Washington 98104

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Preface

The operations manual is intended to be a reference for operators on how the pumping station systems work and how to operate them safely and efficiently. The manual is intended to function as a foundation for a structured operator training program. This manual also meets Washington State Department of Ecology requirements that all King County Wastewater Treatment Division (WTD) facilities have current operations manuals.

The purpose of the manual

This manual is intended to provide the following:

- Descriptions of the pump station, raw sewage pumping systems, force main and the miscellaneous structures along it including components, operation, and controls and indicators
- Operations procedures
- Alarm troubleshooting suggestions
- Routine services checklists

How the manual if designed

To ensure that information is easy to find and understand, this manual is designed in the following way:

Modular. Each section of the manual is composed of modules, self-contained units of information presented on two-page spreads. Each module discusses a single topic and includes all related tables, illustrations, explanations, and references to other source material.

Graphics-based. Each module is developed as an "info-graphic," combining text and illustrations to identify system components and explain their function within the context of the larger process being described.

Who should use this manual

This manual is designed to be used by WTD operations and maintenance, process, capital improvement staff, and contractors.

How the manual is organized

This manual is organized into overview, physical and functional descriptions, control strategies, and operating procedures for each system and subsystem at the pump station.

For further information

- Pump station upgrades,
- _5-2: Built Sunset and Heathfield Pump Stations; 3/65
- W/M8-82: Installed 24-inch-diameter force main 5/83
- VV/M47-84: Replaced Sunset and Heathfield Pumps 9/87
- W/M24-88: Made improvement to landscaping, sumps, and HVAC 6/89
- _____: upgraded PLC _____--

Notes, cautions, and dangers

Notes, cautions, and dangers are used throughout this manual to give you critical information that you will need to complete certain procedures.

NOTE: *Note points out essential information concerning an operating procedure or a condition. Notes can come before or after the procedure or condition to which they apply.*

CAUTION

Cautions identify a practice or procedure that, if not strictly observed, could result in damage or destruction of equipment. Cautions always come before the practice or procedure to which they apply.

DANGER

Danger identifies a practice or procedure that, if not followed correctly, could result in personal injury or loss of life. Dangers always come before the practice or procedure to which they apply

Future revisions

A manual such as this is never complete. It must be regularly updated to reflect changes in systems, equipment, and tasks so that it continues to meet your needs. As you read the

manual, you will undoubtedly discover incorrect, outdated, or missing information. Please help us identify this information by contacting us at one of the numbers listed below.

We will also keep working on the glossary so that it becomes a comprehensive listing of terms you may encounter in this manual.

As this manual is finalized, it will be 3-ring bound and tabbed for easy reference.

Documentation contacts

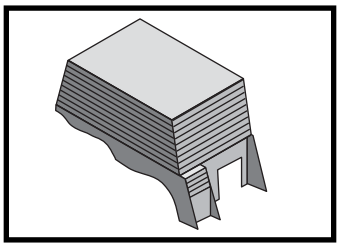
For information on this documentation please call:

- Brian Thompson, 206-263-5424
- Naomi Yura, 206-684-1715
- Barb Johnson, 206-684-2493

Table of Contents

SECTION 1

An Introduction to the Heathfield Pump Station



1.1 An Overview of the Heathfield Pump Station

The Sunset Pumps Station pumps the sewage through one 12-inch, and one 24-inch force main directly into the wet well of the Heathfield Pump Station 3,220 feet away. The sewage comes from the Issaquah interceptor and several local sewers. Heathfield's 24-inch force main pumps the flow about 1,650 feet to the Eastgate discharge structure which also receives flow from the Eastgate trunk sewer. The 12-inch force main pumps to a manhole downstream of the discharge structure. The flow limit at the discharge structure is 15 mgd to avoid local overflows. The flow from the Eastgate trunk sewer then passes through the Lake Hills interceptor and enters the East Side interceptor that flows to the South Treatment Plant.

Flow to the pump stations varies widely, between 100,000 gallons and 14.0 million gallons per day (mgd). About 0.75 million gallons of storage is available in the Issaquah interceptor pipe when flow exceeds the pumping capacity. Both Heathfield and Sunset overflow into Lake Sammamish. Sunset overflows through a 30-inch line, in an overflow manhole in the Issaquah interceptor at station 98+0. Heathfield has a 12-inch overflow from the wet well. The overflow combines with several stormwater sources and enters a 48-inch stormwater detention basin before coming down the hill and entering Lake Sammamish under the dock at the Heathfield Pump Station.

Getting to the pump station

The Heathfield Pump Station is at 3541 163rd SE, in Bellevue. The station driveway is asphalt, but the road from 163rd is gravel. Trees obscure most of the station from the road.

1. **Take I-90 east towards Issaquah.**
2. **Take the 150th Avenue SE exit.**
3. **Continue past the traffic signal on to SE 36th Street.**
4. **Go through the tunnel that goes under I-90 and on to SE 35th Place (Vasa Park Road).**
5. **Turn right on 163rd Avenue SE.**
6. **The station is on the right hand side of the road about halfway up the gravel road.**

Critical information

Critical storage and overflow information for the station includes the following:

CAUTION

Storage times represent the time allowed from shutdown to overflow under normal dry weather conditions. Storage times depend directly on weather conditions and condition of pipes, and times must be adjusted accordingly.

- Storage time: No force main storage, Sunset has 24 hours storage in the Issaquah interceptor
- Overflow: elev.159 ft.
- Overflow location: The overflow is through a 48-inch storm drain equipped with a stormwater detention structure. The first level of overflow goes through an 8-inch sewer line into the Sunset wet well. The second level of overflow goes through a 12-inch line that overflows to Lake Sammamish. The stormwater outfall is under the dock at the Sunset Pump Station.
- Wet well invert elevation: elev. 141 ft.
- Top of inlet sluice gates: elev. 156.0 ft.

Flow information

The following flow information is provided as required by our National Pollutant Discharge Elimination System permit.

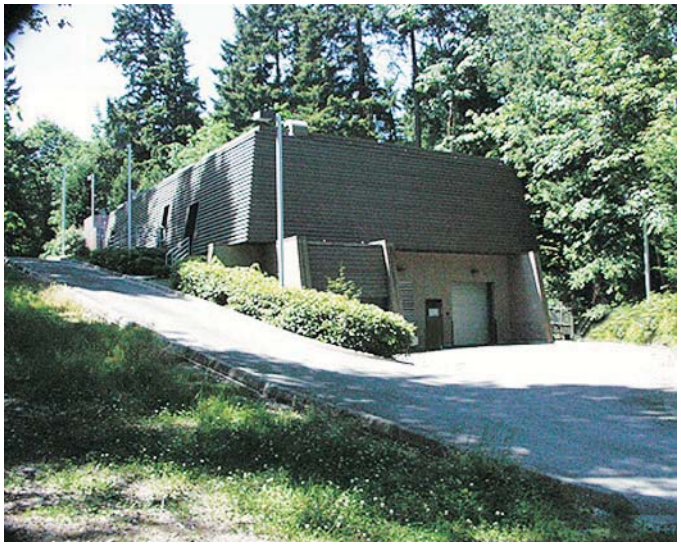
Maximum pumping capacity is restricted to 15 mgd (capacity is 23.4 mgd); firm pumping capacity is 22 mgd (two large pumps, only two pumps can run at a time).

- Average dry weather flow: 2.3 mgd (2003)
- Average annual flow: ____
- Peak wet weather flow: 14.0 mgd (1985)

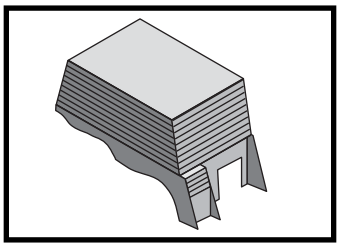
NOTE: Maximum allowable flow from Sunset is 25 mgd, maximum allowable flow out of Heathfield is restricted to15 mgd to prevent local overflows.

Sunset/Heathfield locator map

Looking down 163rd Ave from SE 35th



Heathfield Pump Station



1.2 Where Sunset and Heathfield Stations Fit in the System

Sunset Pump Station collects sewage from the Issaquah Interceptor. The two force mains at Sunset Pump Station pump directly to the Heathfield Pump Station wet well. Sunset and Heathfield stations operate together to lift water from the Issaquah interceptor to the Eastgate discharge structure. The Eastgate discharge structure also receives flow from the Eastgate trunk sewer. Heathfield's 24-inch force main pumps directly to the discharge structure. The 12-inch force main pumps to a manhole downstream of the discharge structure and into the Eastgate trunk sewer. The flow then flows by gravity through the Lake Hills interceptor, where the flow enters the East Side interceptor that flows to the South Treatment Plant.

Layout of the service area

Sunset Pump Station receives wastewater flow from the north through an 12-inch local sewer, and from the south through a 10-inch local sewer. The main flow comes from the 48-inch Issaquah interceptor, which transfers flows from the City of Issaquah, the City of Bellevue, the Eastgate Sewer District, and the King County Water District No. 82. This is pumped directly into the Heathfield Pumps Station wet well. For a map of the Sunset service area, see the Sunset Pump Station manual.

A 10-inch local sewer enters the wet well from the south. Its entry is under the wet well grating and sewage drops from the end of the pipe stub into the wet well.

Hydraulic profile

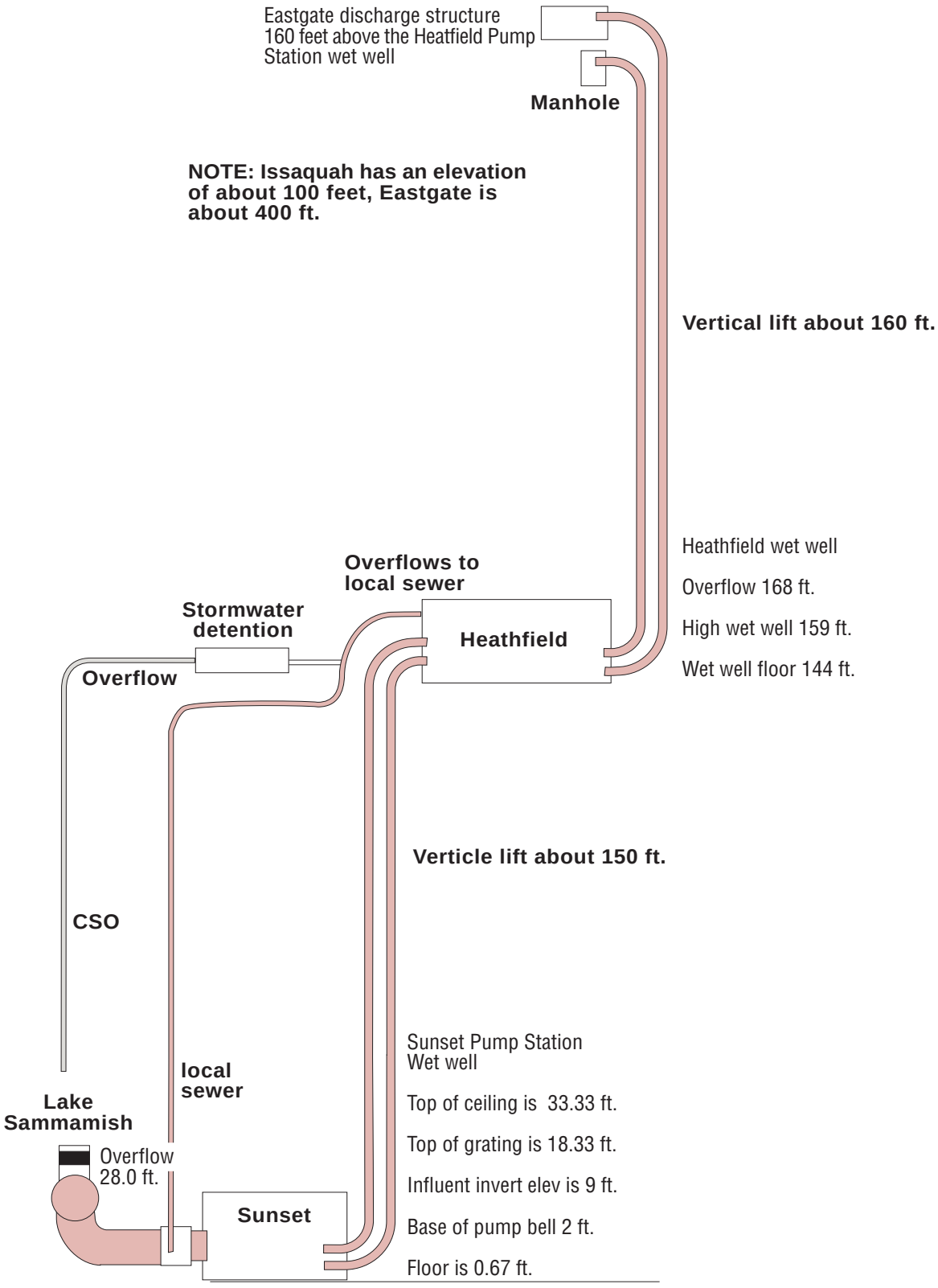
The Sunset Pump Station is about 150 feet below the Heathfield Pump Station. The Heathfield Pump Station is about 160 feet below the Eastgate discharge structure.

NOTE: The measurements for the wet wells are from the drawings; however, because Issaquah has an elevation of about 100 feet and Eastgate has an elevation of about 400 feet, these measurements may be relative and not true elevations. So about 100 feet should be added to all of the wet well measurements given to convert them into true elevations.

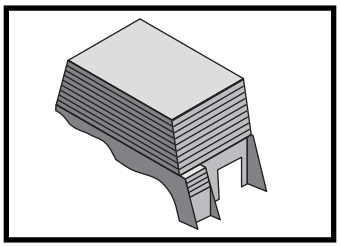
Eastgate discharge structure

The station discharges to the Eastgate trunk nearly one-third of a mile west and 160-feet up through two parallel force mains. The force mains enter the Eastgate trunk sewer on opposite sides of Eastgate Way, near its intersection with SE 35th Place.

The 24-inch force main ends at the Eastgate discharge structure; the 12-inch force main empties into the trunk sewer at a manhole just downstream of the structure and across the street. An air vent valve for the 12-inch forcemain is located in a manhole in the planting on the west side of SE 35th Place, about 150 yards before the intersection with Eastgate.

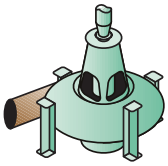


Heathfield/Sunset hydraulic profile



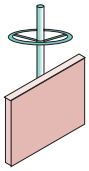
1.3 An Overview of the Systems at the Station

The major systems at the pump station are the raw sewage pumping system, influent control system, and the force main system. These systems are supported by the auxiliary systems that include: electrical, water, instrument air, hydraulic, HVAC, hoisting, drainage, and odor control. Once the pumps and auxiliary systems are set up to operate automatically, no operator intervention is needed, except for routine service checks and alarm investigation.



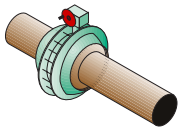
Raw sewage pumping system

The pump station has four variable-speed raw sewage pumps (RSPs), two small and two large. In AUTO only two pumps, either a pair of large or small pumps, can run at a time. One small RSP can pump 3.7 mgd, and a large pump can pump 11 mg. RSP 1 pumps to the 12-inch force main and RSPs 2, 3, and 4 pump to the 24-inch force main. See “Raw Sewage Pumping” on page 6-1 for more information.



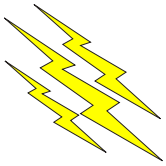
Influent control system

Influent enters through two normally-open manually-operated slide gates. Supply and exhaust fans (normally on) maintain a safe working environment in the wet well. See “Influent Control” on page 5-1 for more information.



Force main system

The raw sewage pumps discharge to two force mains that convey the effluent to the Heathfield Pump Station wet well. A manually-operated gate valve isolates the force main from the station. Two flow meters monitor the effluent flow rate. See “Force Mains” on page 7-1 for more information.



Electrical systems

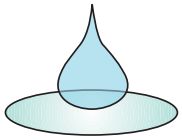
Puget Sound Energy provides power to the Heathfield Pump Station. There are two 12 kV feeders, each from a different substation. Each feeder supplies electricity to about half the equipment at the station. The odd- numbered equipment is supplied by one feeder, the lighting and even-numbered equipment by the other.

The12.5 kV power is stepped down by 480V transformers for the RSPs, motor control centers (MCCs), and other 480 V equipment. Two 120/240 V step-down transformers provide station lighting and control power.

An automatic transfer switch on the main service line from each feeder automatically starts and transfers the load to a standby generator. The generator can provide power to one feeder. The main service panels also have an emergency tie breaker that allows all the equipment to be fed from one feeder.

An uninterruptable power supply system provides up to 4 hours of backup power to the control system if the power fails.

Most station equipment is locked out at the MCCs in the station’s control room.

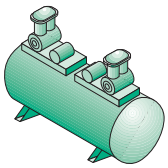


Water systems

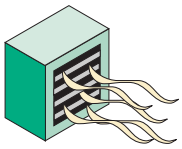
The City of Bellevue supplies water to the station. Three water systems distribute this water. The C1 system provides potable (drinkable) water. A C2 water system provides low pressure non-potable water for process, and washdown water. A C2HP water system provides non potable high pressure water to the raw sewage pump seal/flushing water system.

Auxiliary systems

The auxiliary systems are the instrument air system, four monorail hoists, a drainage system with two sump pumps, and the heating and ventilation systems. For more information, see “Auxiliary Systems” on page 9-1.

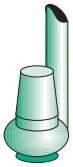


Air system. The air system supplies water- and oil-free compressed air to the bubbler level sensor. Proper operation of the air system is important because the PLC and backup level control programs use the bubbler for level information. The system has two compressors mounted on a single receiver tank and an air dryer. The compressors run automatically in lead/follow, and are controlled by pressure switches.

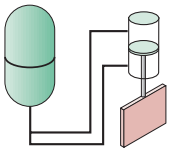


HVAC. The pump station has several different heating and ventilation systems that automatically operate to maintain safe working conditions inside the station. These systems remove odors and explosive and toxic gases and helps prevent corrosion caused by condensation.

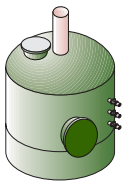
Hoisting system. The station has four monorail hoists that can lift 3 tons each. The hoists have a 16-foot lift. The hoists are used to move heavy equipment in and out of the pump room.



Drainage system. The station has a dry well sump with two sump pumps that run in lead/follow. The pumps are located on the pump room floor, right next to the dry well sump. Both pumps run automatically, controlled by float switches. Heathfield also has a stormwater system that is quite involved, and includes a stormwater detention basin. The rest room and service sink drainage flow to Sunset Pump Station's wet well.



Hydraulic system. The hydraulic system has two hydraulic pumps that create the 2,000 psi hydraulic pressure needed to operate the RSP discharge valves. Each of the four valves has an emergency accumulator to close the valve if the system fails.



Odor control system

The pump station has a carbon odor control system to treat odors from the wet well. See "Odor Control" on page 10-1 for more information.

Control system

Most of the systems at the pump station have hardwired control. The RSPs have three levels of control. The PLC and local LIC control strategies are computer controlled; the float control system is hardwired.

Alarms. Station alarms register locally at the main control panel in the control room. Some of the alarms also register at Main Control at the South Treatment Plant through Metrotel III. See "Alarms" on page 4-1, for more information.

PLC. The PLC is an Allen-Bradley PLC, with an operator interface with a touch screen and a 10-key function key pad. The OIU is used to monitor the PLC control of the RSPs. It uses Rockwell Automation BanelBuilder32 software. It runs one of the RSP control strategies.

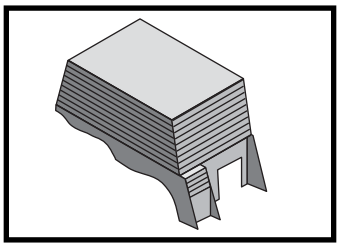
Standby level control. The standby level controller or local LIC is run by a Moore controller.

Float control. A stand-alone float control system can start and stop the two large pumps if the two other pump control systems fail.

Intertie. Sunset and Heathfield Pump Stations are connected by an intertie. A Heathfield wet well high alarm will start PLC control of the Sunset RSPs using this intertie. The pumps are controlled by the Heathfield PLC until the Heathfield wet well level drops. The telemetry cable route follows Sunset's 12- inch force main. The CATAD is circuit2 FDDA 7772 SEGMENT CA.

MetroTel III. Metrotel circuit100.00, RTU 6 connects the Heathfield Pump Station to South Plant using a leased telephone line.

SCADA. The Forney system at South Plant also receives input from the pump station. The operator at South Plant can shut down the Sunset RSPs remotely, if the intertie fails.



1.4 Control and Monitoring

The PLC monitors the following key processes at the pump station: alarms, which RSPs are running, their speed, wet well level, lead/follow RSP sequence, and the PLC status. The PLC is housed inside the main control panel. A touch screen for the operator interface unit (OIU) is mounted on the front of the cabinet door, its screens are used to monitor the PLC data at the station. A telemetry unit passes the PLC data and alarms over phone lines to the SCADA system (Forney) at South Plant. There is a redundant MetroTel III system that also transmits the data to South Plant but displays it on the MetroTel computer in the DCB. The PLC also provides the PLC control of the RSPs, but uses the operator-selected switches, Moore controllers, and pressure switches to control and configure the system; there are no control selections available on the OIU.

PLC

The Allen-Bradley PLC is a rack system. Each rack has a large power supply module, a CPU (computer) module (with a key) and plug-in modules for communications, and inputs and outputs (I/O modules). Each module has a red (bad) or green (good) status light. When everything is okay all, the lights should be green.

Operator interface unit

The PanelView OIU runs an application that pulls information from the PLC and displays it graphically on a screen. The PanelView is a stand alone computer, and can fail while the PLC continues to work normally. The OIU has a touch sensitive screen, a keypad, a computer (CPU), and a communication modules.

Telemetry units

The telemetry unit is essentially the modem through which the PLC communicates to South Plant over phone lines. About every two minutes, the PLC sends a burst of data to South Plant. The row of red lights on the front of the unit flash when the data is sent. If the telemetry unit fails, it does not affect the PLC. There is a telemetry unit for the SCADA system and one for MetroTel.

Using the operator interface

The PanelView, displays screens for the operator to monitor status and acknowledge alarms. To select a screen or an item, touch the button on the screen. The only buttons that normally work are the ones used to select the different screens. Some of the screens can be used by maintenance to adjust the set points in the PLC, these adjustments are password protected. To see a copy of all the screens see Appendix _____.

Except for the up and down cursor buttons when the alarm screen is on, the function keys and keypad are inactive in the monitoring software. You do not have to use the arrow keys in the alarm screen because it has its own up and down arrows on the touch screen.

Icon color. The pump icons are color coded to indicate the status of the pump motor.

- Red, the motor is running
- Green, the motor has power and can run
- Purple, there is no power to the motor

If the pump is not in AUTO, then NOT IN AUTO will be indicated in a yellow strip under the pump.

If an alarm is active the box will be red, and it will be listed on the Alarm History screen, if not there is just a gray box place holder.

Total run time. The total run time indicated on the PLC is different and separate from the hour meters on the MCP. It represents the run time since the PLC was hooked up.

Backup level controller

The backup level controller a modular, rack-mounted version of the standard Moore 353 controller. The controller is located inside the control panel. It looks like the PLC except that it is purple and says Moore on it. The modular version of the controller is needed at Sunset because the control program requires more inputs and outputs (I/Os) then the standard Moore controller has. The modular unit is connected to a standard Moore 353 mounted on the front of the cabinet as an operator interface.

Alarm history screen

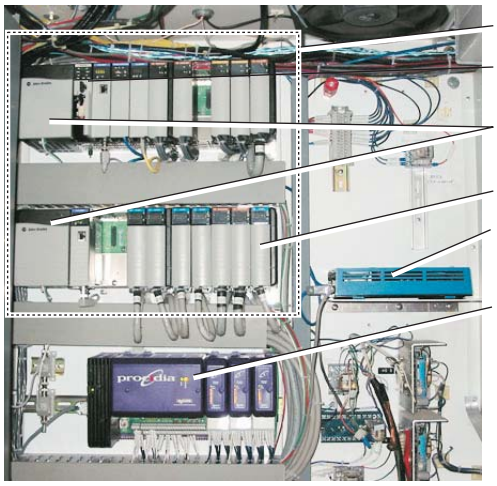
The alarm screen displays current and historic alarms that have registered at the station and at South Plant. Normally, alarms are listed by time and date starting with the most recent. Alarms are color coded: Yellow indicates a critical alarm requiring immediate attention, and red is less urgent.

Acknowledging an alarm. When an alarm is acknowledged, the date and time the alarm was acknowledged displays on the screen. If there is no date/time listed for an alarm, then that alarm is not acknowledged.

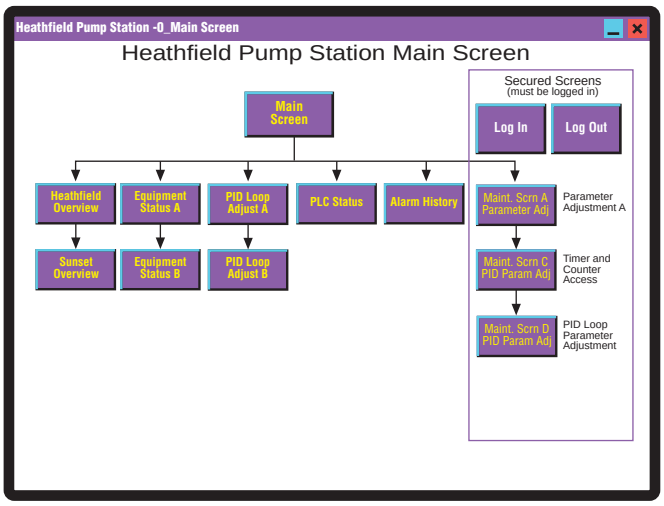
NOTE: You must acknowledge station alarms at both the OIU and the annunciator panel. Acknowledging alarms at the annunciator panel does not acknowledge them in the PLC.

1. **Select the alarm.**
   Press arrow buttons to highlight the alarm.

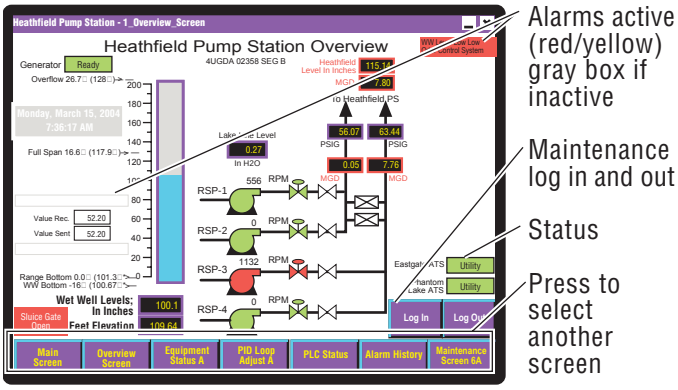
2. **Press Ack Alarm**
   The date and time will appear in the Acknowledge Time column of the alarm list.



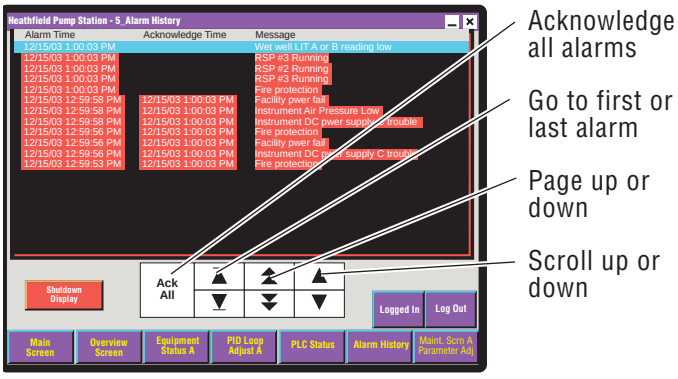
PLC and back-up level controller



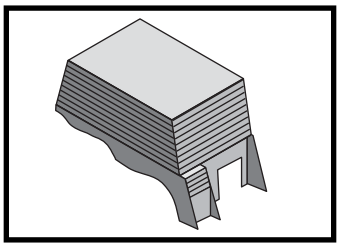
Main screen



Overview screen



Alarm history



1.5 Checking and Troubleshooting the PLC

This module describes basic procedures to check the status of the PLC and troubleshoot problems. Check the status of the PLC as part of your standard station checks. If there is a problem with the PLC, try restarting the it once. That often will clear up a fault or communication error. If the problem continues, call the instrument technicians. The PLC is for monitoring only. The station will continue to operate normally without the PLC.

Checking the status of the PLC

Check the status of the PLC as part of your standard station check.

1. **Check the annunciator panel for a PLC alarm.**
2. **Check the overview screen.**
   If the numbers representing flow, level, and rpm looks like a string of asterisks (*****) rather then numbers then there is a communication failure with the PLC. Restart the PLC to clear the fault. If that doesn't fix the problem, then restart the PanelView.
3. **Check the PLC status screen.**
   Look for green boxes labeled OK under the representation of each module.
4. **Check the PLC modules.**
   Open the cabinet housing the PLC. You should see nothing but green status lights on the modules. If you see a red light restart the PLC to clear the fault.
5. **Check the telemetry unit.**
   The telemetry unit is the blue box located at the base of the PLC cabinet. The row of red lights on the front of the unit flash when it sends data to south Plant. The unit only does this every couple minutes.

Restarting the PLC

If you think there is a problem with the PLC, then restart it once. Call the instrument technicians if the restart does not clear the problem. Restarting the PLC will cause a PLC FAILURE alarm at South Plant

1. **Open the PLC cabinet door.**
2. **Open the faceplate on the power supply modules.**
   There are two power supplies, one for each rack of modules. They are the two large modules on the left side of the rack. The door is hinged on the left and simply pulls open.
3. **Switch OFF the power to both modules.**
   The ON/OFF toggle switch is on the front of the power module behind the faceplate.
4. **Switch ON the power to both modules.**
   Count to four, then switch the toggle back to ON.
5. **Wait for the PLC to boot up.**
   - Watch the hardware for a red fault light.
   - Watch the interface unit for proper-startup.
6. **Close the faceplate door.**
7. **Close the PLC cabinet.**

Restarting the PanelView

The PanelView operator interface is a standalone computer communicating with the PLC. If the PanelView fails, use the RESET switch to restart the terminal without having to disconnect and reapply power.

1. **Open the cabinet door**
2. **Find the reset button on the back of the PanelView.**
   The reset button is located on the edge of the small box attached to the back of the PanelView.
3. **Insert a thin probe into the hole marked RESET and press the switch**
   The computer will perform a series of startup tests and automatcally start the software.
4. **Check the operator interface for proper operation.**
   The unit will open to the overview screen.

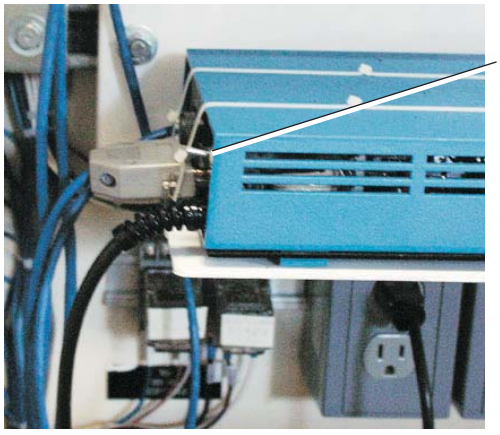
5. **If the unit is still not working, call the instrument technicians.**

Restarting the telemetry unit

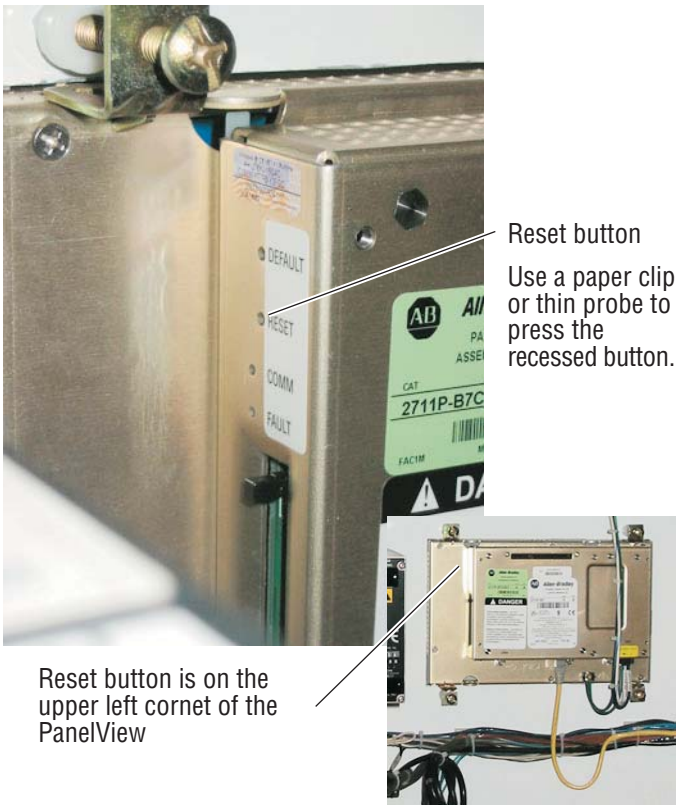
If South Plant looses communication with the station, it could be the telemetry unit is in fault.

1. **Open the PLC cabinet door.**
2. **Switch OFF the power to the telemetry unit.**
   The ON/OFF toggle switch is on the back of the unit (left side as it sits in the cabinet.
3. **Switch the power back ON.**
   Count to four and switch the power back on at the toggle switch.
4. **Watch the unit boot up.**
5. **Check in with the DCB.**
   Wait a couple minutes then call the DCB to see if the unit is sending data.
6. **Close the PLC cabinet door.**

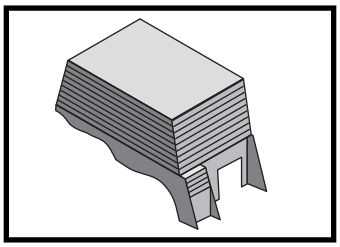
Reset the PLC



Reset the telemetry unit



Reset the PanelView



1.6 Locations and Layout of the Ground and Roof Levels

The pump station has two levels: This module describes the layout of the ground floor, and the roof level.

The control room, motor room, are located on the ground floor. The pig launchers are located on a concrete pad east of the station. The generator trailer is located east of the pump station building. The pump room, HVAC room, rest room, and odor control room are located on the lower level. The wet well is on the lower level, isolated from the rest of the pump station.

Control room

The entrance to the control room is on the south side of the building. There are steps up to the door. The telephone terminal board is just inside the door on the west wall.

The main control panel faces the motor room. The control power panel is located just north of the main control panel.

MCC-A and -B are on the same wall, the south wall of the control room. Lighting panel boards are lined up on the north wall of the control room near the east corner. The electrical switchgear and service panels along with four adjustable frequency drives (AFD 330,001 through AFD 331,004) are in the middle of the room. The two harmonic filters are on the north end of this lineup. The four transformers for the RSPs (TFR 330,001 through TFR 330,004) are lined up on the east wall. The uninterruptable power supply (UPS) is the north wall.

Motor room

The motor room contains two small (M330,001 and M330,002) and two large (M330,003 and M330,004) raw sewage pump motors. The motors are connected to the pumps by vertical drive shafts.

The discharge from each pump enters the motor room through the floor, and each RSP discharge has an isolation valve (330, IV05 through IV08). RSP 1 and 2 discharge to one 24-inch manifold, and RSP 3 and 4 discharge to another. An extension of the discharge of RSP 2 also connects it to the 24-inch manifold this can be isolated with (331, XXXX). The two discharge manifolds are cross connected, and a normally closed valve (330, IV10) allows any pump to pump to either forcemain. Each manifold has an isolation plug valve (330, IV09 and 330, IV11). These are located in the southwest corner of the room.

The discharge manifold for RSPs 1 and 2 also has an isolation valve (331.IV12) just before it enters the 12-inch force main. The discharge manifold for RSPs 3 and 4 has a similar isolation valve (331.IV14) just before in it enters the 24-inch force main.

The accumulator bank and control unit for the hydraulic discharge ball or check valves are on the northwest wall of the motor room.

Two instrument air compressors (CP330,111 and CP330,112), air receiver tank (PVL330,113), and air dryer (MME330,114) are on the east wall next to the main control panel.

The wet well transfer fan is in the southeast corner of the motor room.

There is an equipment hatch in the floor of the motor room near RSP 4. The stairs to the pump room are the north wall. Stairs up to the pig launcher pad are on the west wall.

The C2 break tank is in the north west corner of the motor room.

Wet well

The door to the wet well is on the ground level on the south side of the building. This is the only entrance. The forcemains enter the wet well from the northeast, the slide gates are on the east wall, the racks on on the north and south walls next to the gates. The 10-inch local sewer enters from the south near the door and extends just beyond the walkway grating. There is a flow meter (FE 3003.603) on the end of the pipe. The bubbler control panel is mounted on _____.

Pig launchers

You can access the two pig launchers and the gravity relief vent from the motor room stairs on the west wall or through the yard gate on the south side of the building.

Generator room

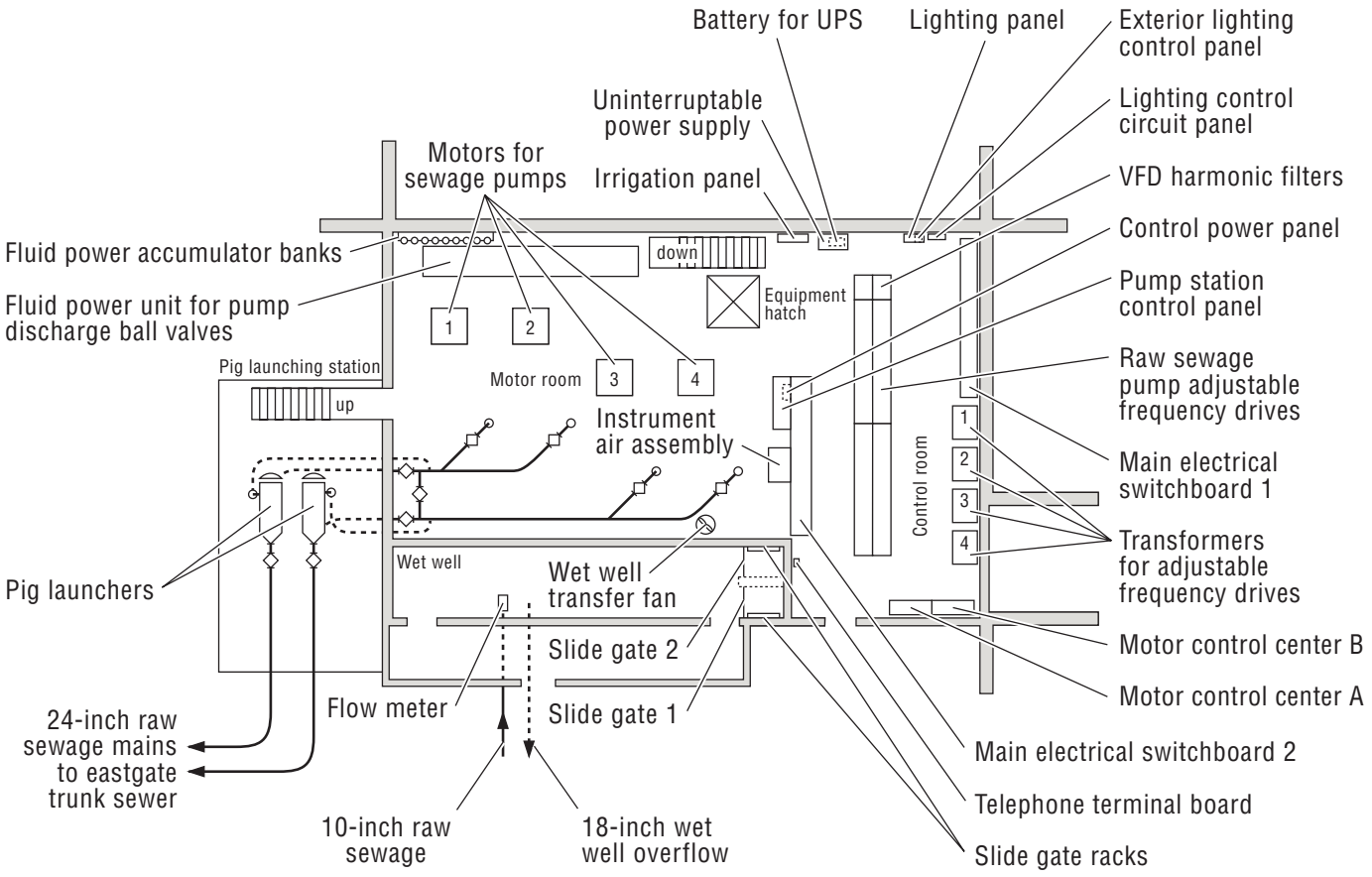
The standby generator is housed in a stand alone building west of the pump station building. The access to the generator building is through the pig launcher yard. The diesel fill valve is outside the fence and can be accessed from the drive.

Entering the wet well

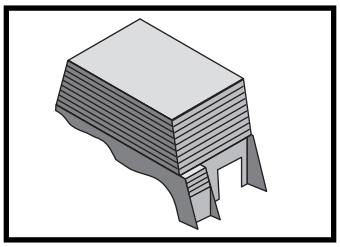
DANGER

The Heathfield Pump Station wet well is a permit-required confined space. Open the wet well access door only far enough to reach inside and turn on the light switch that starts the exhaust fan.

If the wet well transfer fan is in AUTO, the wet well should be ventilated for at least 30 minutes before anyone enters the wet well area. Use your own meter to check the wet well before entering. Continuously monitor the air quality inside the wet well for hydrogen sulfide, explosive gases, and oxygen content.



Heathfield first floor



1.7 Locations and Layout of the Motor and Pump Levels

The pump station has two interior floors. This module describes the layout of the lower level of the dry well, which includes the pump room, HVAC room rest room and odor control room. The odor control room is on this level in the southwest corner of the building, but can only be accessed from the outside. The wet well extends to this level but is totally separated from the dry well and there is no access to the wet well from inside the pump station.

The pump room is the lowest level of the dry well. Stairs near the north wall of the control room provide access. There is also a door in the east wall that opens to the pump room near the HVAC room.

Pump room

The pump room has a roll door on the east wall at the north end of the building. There is a man door next to it. There are stairs on the north wall up to the motor room.

The pump room contains two small raw sewage pumps (RSPs) P330,001 and P330,002) and two large RSPs (P330,003 and P330,004). The suction isolation valve, hydraulic check valves, and control valves for each pump are between the pump and the common wall with the wet well. The pumps discharge through the ceiling to the motor room above. The discharge isolation valves are in the motor room. The seal/flushing water manifold for each RSPs is on the south wall near the pump suction.

In the northwest corner are the dry well sump and sump pumps (P 330,005/6). In the southeast corner are the two seal water pumps (P330,011 and P330,012), the washdown water pump (P330,014), and the hydro pneumatic (bladder) tank (PVL 330,013).

NEW FLOW METERS will be added.

There is a work bench in the northeast corner of the lower level.

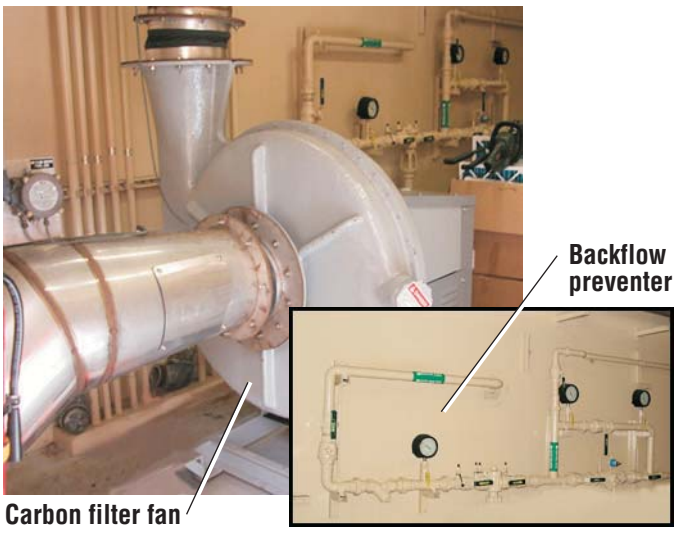
Rest room

The rest room is in the southeast corner of the motor room. The service sink and toilet drainage is routed to the Sunset wet well.
HVAC room

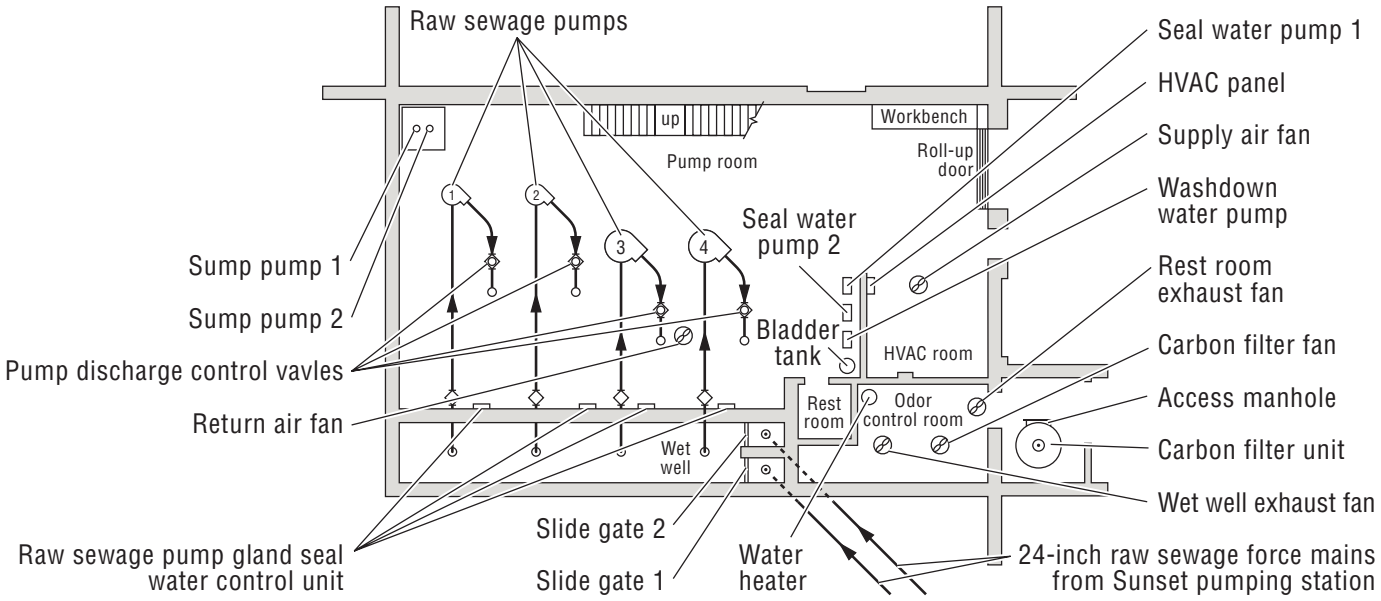
The HVAC room contains the dry well supply air fan (F330,221). The HVAC local control panel is on the west wall of the room.

Odor control room

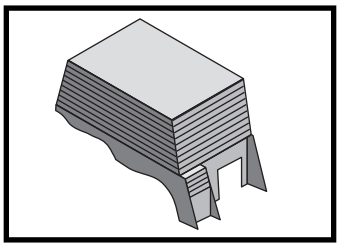
The odor control tower is in a yard in the south-east corner of the building. Through this yard you can enter the odor control room. The odor control room contains the water heater, the rest room exhaust fan (F330,226), the carbon filter fan (F330,225), and the wet well exhaust fan (F330,224). The city water shutoff in the station and the backflow preventer are in also the odor control room, but the break tank is located in the northwest corner of the motor room.



Odor control room



Heathfield lower floor



1.8 Locations and Layout of the Exterior, Yard, and Piping

The pump station has some landscaping with an irrigation system. There is also an extensive stormwater collection system. This module describes the layout of the grounds including forcemains, utility entrances, storm drainage system, irrigation, driveways, fences, and gates.

Forcemains

The Sunset forcemains run along the east edge of West Lake Sammamish Parkway SE until they turn the corner and follow the south edge of SE 38th Street. Just before 166th Avenue SE the forcemains cross the street and follow the north edge of SE 38th Street as it becomes 164th Place SE. The forcemains then run horizontally parallel to each other with the 24-inch force main on the north side the 12-inch on the south. They turn the corner at SE 163rd Avenue and follow the gravel road up to the driveway. As the 12-inch forcemain nears the driveway it becomes a 24-inch line. Both forcemains enter the wet well from the east.

The Heathfield forcemains run west from the station and then north up to SE 35th Place. The force mains enter the Eastgate trunk sewer on opposite sides of Eastgate Way. The 12-inch force main follows the north side of SE 35th Place to a manhole just downstream of the discharge structure. The 24-inch force main follows the south side of SE 35th Place, and empties into the Eastgate discharge structure located where SE 35th Place crosses Eastgate Way. From here, the Eastgate truck sewer joins the Lake Hills interceptor which joins the East Side interceptor.

Local sewers

A 10-inch local sewer enters the wet well from the south. The service area for this sewer is _____. The sewer passes through manhole 2, then 8 and then 7 all located on the south side of the building.

Electric utility

Electric utility is supplied by Puget Sound Energy (PSE). The 12.5kV transformer is maintained by PSE. The transformer is located on the west side of the building.

City water

Water is supplied by the City of Bellevue. The water line connects to the main running along the gravel road. The water meter and shutoff is located in the planting strip where the driveway starts. It is on the north side of the driveway. The water line runs along the south edge of the driveway into the southeast corner the building and into the odor control room.

Irrigation

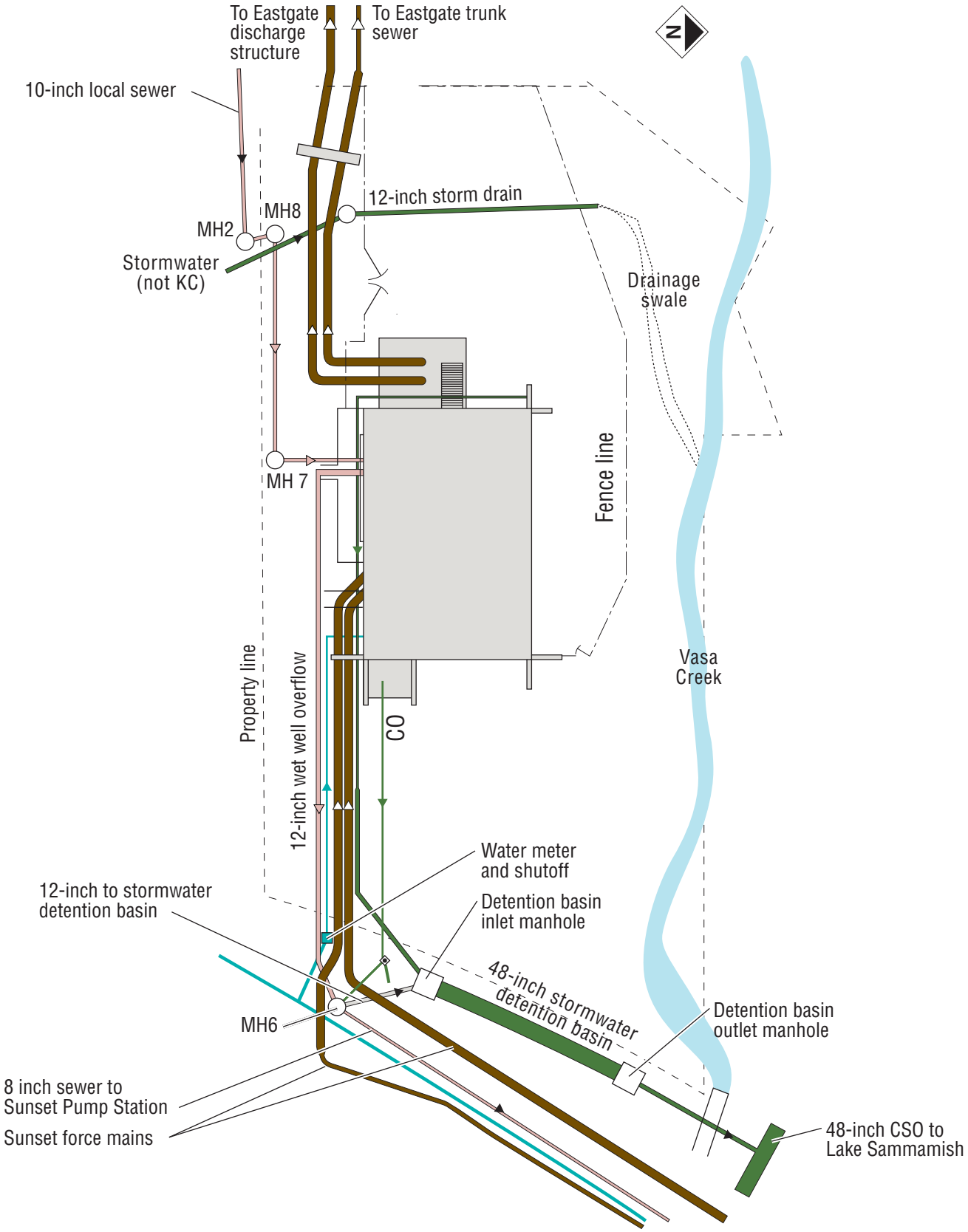
The irrigation system uses C1 water. One shutoff is located at the backflow preventer in the rest room. The other shutoff is accessed through a 4-inch PVC sleeve. The cap is located _____ SEE DETAIL C on dwg G7. Each of the two zones has an electric valve (inside a valve box) located in the planting areas. The controller is located on the north wall of the motor room at the top of the stairs.

CSO

Overflows from Heathfield . An 18-inch overflow from the wetwell is directed through a 12-inch line to manhole 6. An 8-inch sewer line from this manhole goes to the Sunset wet well. A higher 12-inch overflow from this manhole goes into a 48 inch stormwater detention basin.

Stormwater detention basin. A 6-inch foundation drain with several catch basins empty into the 48-inch stormwater detension basin. There is a 12-inch overflow from manhole 6 to the inlet manhole on the detension basin.

A12-inch stormdrain line from the outlet of the basin goes into a 48-inch storm drain line that also picks up street run off and goes down the hill and empties into manhole 12 at Sunset Pump Station and empties though and outfall under the dock at Sunset into Lake Sammamish.



Heathfield yard diagram

Storm drains

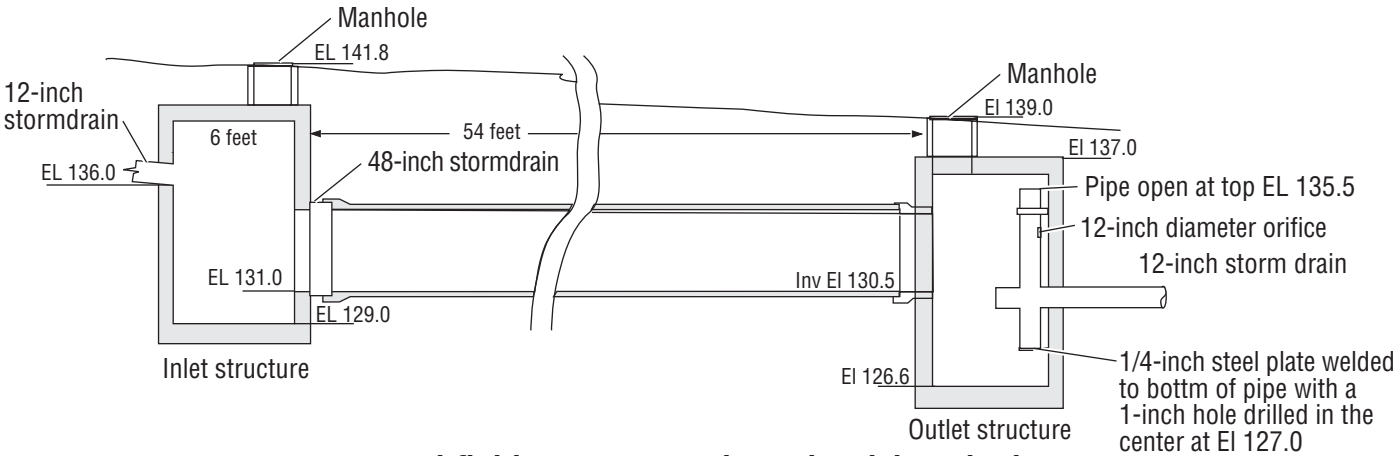
The catch basins in the driveway empty into a 12-inch storm drain line that goes directly to the inlet of the detention structure. Roof drains empty into a 4 inch SD line under the odor control area; these combine with a 4-inch storm drain that empties into manhole 6.

Driveway and gates

A fence surrounds the back of the station and encloses all the equipment except for the diesel fuel fill valve. There is a man gate near the northeast corner of the building and a truck gate at the back of the station (west side) near the pig launchers.

The fill valve is on the north side of the driveway near the yard with the generator room, inside a locked cabinet.

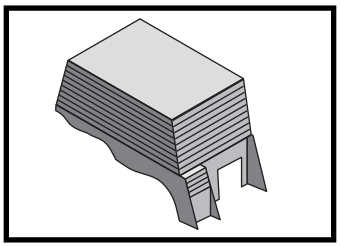
NOTE: There is a surface water detention pond south of the station with a 12-inch storm drain line that passes through Manhole 1 to a swale on the north side of the property and onto Vasa Creek. While manhole 1 is on the station property this is not our system.



Heathfield stormwater detention (elevation)

Stormwater detention basin inlet manhole

Stormwater detention basin outlet manhole



1.9 Location and Layout of the Eastgate Discharge Structure

The two parallel force mains discharges to the Eastgate trunk nearly one-third of a mile west of the station. The force mains enter the Eastgate trunk sewer on opposite sides of Eastgate Way, near its intersection with SE 35th Place.

The 24-inch force main ends at the Eastgate discharge structure; the 12-inch force main empties into the trunk sewer at a manhole just downstream of the structure and across the street. An air vent valve for the 12-inch forcemain is located in a manhole in the planting on the west side of SE 35th Place, about 150 yards before the intersection with Eastgate.

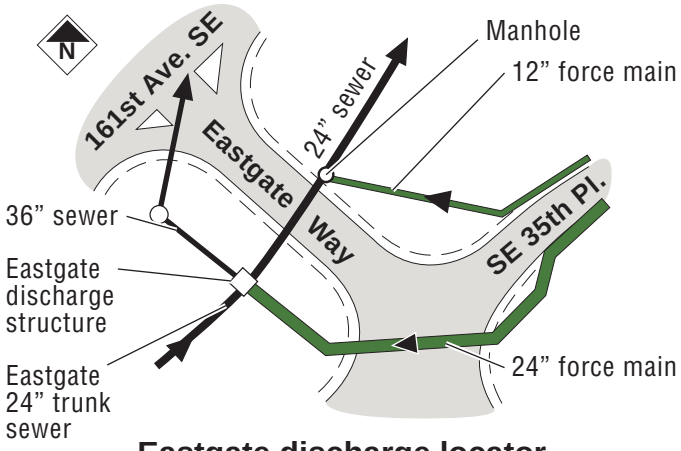
Getting there from Heathfield

The discharge structures are spread accross the intersection of SE Eastgate Way and SE 35th PL.

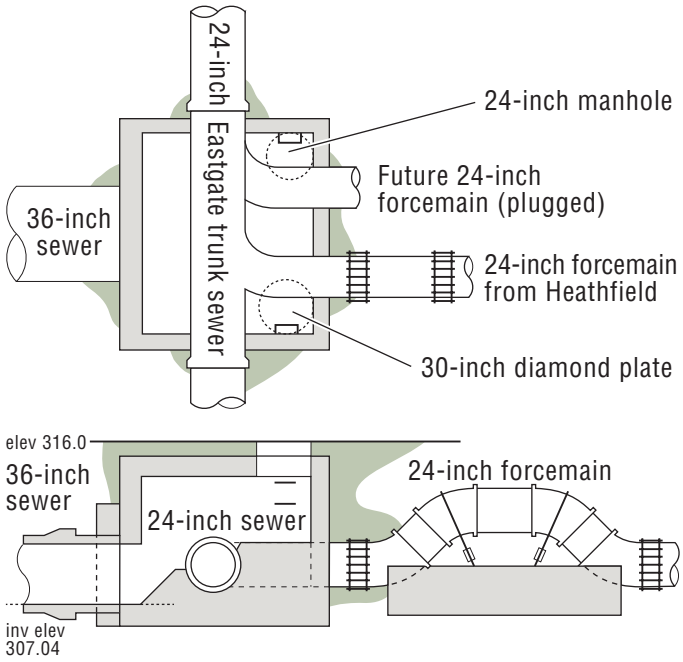
1. **Turn LEFT on 163RD AVE SE toward 164TH PL SE.**
2. **Turn LEFT onto 164TH PL SE.**
3. **Turn LEFT onto SE 35TH PL.**
4. **SE 35th PL intersects with SE Eastgate Way.**
   Park at the side of the road. Be aware of traffic inthe intersection.

Eastgate discharge structure

Eastgate discharge structure

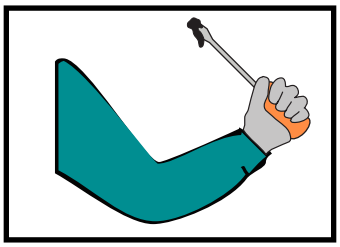


Eastgate discharge locator



Eastgate discharge structure

SECTION 2
Routine Services



2.1 An Overview of Routine Services

The Heathfield Pump Station normally operates automatically and is unmanned. However, the station requires routine servicing twice a week to keep it running smoothly. Always notify South Plant Main Control and follow the procedures described in this module to verify that it is safe to enter the station. Then you can start your duties by obtaining status information about the station equipment from the station logbook and the main control panel (MCP). After obtaining status information, you are ready to perform a detailed inspection and correct minor problems before they become major ones.

Entering the station

Before entering the station to perform your duties, do the following:

1. **Notify South Plant Main Control.**
2. **Verify that the dry well heating and ventilation system is operating.**
3. **Verify that all supply and exhaust fans for the wet well and odor control rooms are operating.**
4. **Record your visit in the station logbook.** Include your name and the date, time, and reason for your visit.

Getting status information

Obtain information about the station status from the following sources:

Station logbook. Check the logbook on the desk for the latest status information about the station including the following:

- **Alarms.** What alarms have been verified? What was done to correct the alarms?
- **Process adjustments and tests.** Are there any process adjustments or tests being run?
- **Operating modes.** In what mode is each major piece of equipment operating? Is it the normal mode?
- **Equipment problems.** Is there any equipment having mechanical problems?

MCP. Check the MCP to see what equipment is operating and whether there are any alarms that require your immediate attention.

1. **Check the alarm annunciator panel for alarms.**
2. **Test the alarm panel lights.** Push the TEST button. All the lights should turn on. If a light is not working, replace the burned-out bulb and test again.
3. **Check and record the motor control center major equipment hourmeter readings.** Record the readings on the Equipment Hourly Chart kept at the station desk.

   Most of the run hours readouts are on the switchgear.

   - RSP #1, #2, #3, and #4
   - Sump pump 1 and 2
   - Seal water pump 1 and 2
   - Instrument air compressor 1 and 2
   - Ball valve hydraulic pump 1 and 2
   - Sluice gate hydraulic pump 1 and 2
   - Wash water pump 1
   - Standby generator

4. Check the hours for the variable frequency drives (VFDs) as follows????

   Check the hourmeter by pulling up the 601 running hours window on the alpha-numeric display on the VFD:

   a) At the VFD, press the EXTEND MENU key.

   b) Press the down arrow key until “6. service functs” is displayed.

   c) Push the down arrow key until “VFD Pump & Motor—601 running hours” is displayed.

Work requests. Review the work requests to see what equipment is in need of repairs. Work requests are kept _____.[1]

MCP. Check the MCP to see what equipment is operating and whether there are any alarms that require your immediate attention.

5. **Check the chart recorder.**
   Replace the disk when 90% full; file disks at the station desk for 1 year reference on equipment history. (Chart disks are kept at the South Plant for 7 years.)

6. **Check the pump mode.**
   The mode should correspond with the designated lead-follow sequence.

7. **Verify the settings of level controllers.**

Lockout/tagout file board. Check to see what equipment is locked out. During your detailed inspection, make sure tags and keys match with the locked out equipment.

Performing the detailed inspection

During your detailed inspection, you will monitor equipment for signs of failure, obtain data from instruments, visually verify computer readings, troubleshoot alarms, and document equipment deficiencies. To perform the inspections, you will need a Pump Station General Checklist, pen, and flashlight.

- **Use the Pump Station General Checklist as a guide.** The checklist lists all the items you need to check in the station. It is included in Appendix B. For details on how to perform the checks, see modules 2-2 to 2-5.
- **Observe the operation of all moving parts as you pass them.** Are they running true? Are there any unusual noises? Is anything hot to the touch, or vibrating?
- **Stay alert.** Be observant and alert for signs of potential problems—try not to get into the mode where you assume everything is OK. For example, when checking gauges and indicators, look carefully to make sure that the needle or indicator is free to move. (If it is not, do not try to free it—it may break or bend. Call maintenance.)

  Also, remember that although computers and gauges are ways to monitor equipment, you should use your senses—sight, hearing, smell, and touch—to determine whether the equipment is operating normally.
- **Make sure the area is clean and neat.** Check to see that floors are clean and that hoses are coiled and stored where they belong. Make sure wet floors are marked with a sign to prevent someone from slipping.

Leaving the station

When you are ready to leave the station, follow these procedures:

CAUTION

If you have made any changes to the station's control settings, make sure that they are in effect, that the station is stabilized, and that everything is running properly before you leave the station.

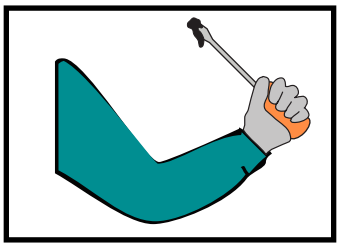
1. **Recheck the MCP for alarms.**
   Resolve any alarms before leaving the station.

2. **Sign out in the station logbook.**
   Record the work performed or changes to the station controls.

3. **Verify that the lights are off and all doors to the station are locked.**

4. **Notify South Plant Main Control that you are leaving the station.**

1. Where are work requests kept?



2.2 Making Entries into the Station Logbook

A station logbook is kept in the control room. During your routine service visits to the station, you are responsible for recording equipment problems or events such as special testing in the logbook. The logbook is a legal document and it is important that you keep it up to date with accurate and complete entries. It is also a valuable source of information—review it before you start your routines so that you know what problems to expect and what has been done about them.

What to enter in the logbook

Carry a note pad during your service visit to write down any of the following problems or events.

- Equipment with mechanical problems, or equipment that is off-line or out of service. Include the following information, as applicable:
  - Description of the problem and equipment involved, including current set points, operational mode, and associated alarms
  - Date, time, and area in which the problem or event occurred
  - What has been done about the problem, including whether a work request has been filled out and who performed the action
  - Whether other equipment or processes have been affected by the problem
- Process adjustments requested by operations, process control, maintenance, electrical or other personnel
- Special projects or tests
- Any tasks performed, such as cleaning a sump, so that the next person does not repeat the task unnecessarily.

Making an entry

Follow these guidelines:

- Use ink to make your entries (this is required because the logbook is a legal document).
- Print clearly and legibly. If you make a mistake, neatly draw a line through it or cover it with correction fluid.
- Highlight any special conditions so that others will be able to see it easily.
- Mark your entries with your initials.

Using the chart recorder

Use the following keys to operate the chart recorder.

	Softkey—activates Quick Menu for: review of Shift, adding a Marker, and viewing the Events List and Totals.
	SHIFT key—used with other keys (e.g. SHIFT & MODE –captures screen. SHIFT & MENU–turns off display.
	Left arrow—Replays data backwards to the start of last session.
	Right arrow—Replays data from start of last sessions.
	Up arrow — In Replay mode, changes direction of replay.
	Down arrow—freezes the display in Replay or Real-time mode
	MODE key —switches display mode (e.g. Conventional/Tiled OuickView/Normal.- 9
	MENU key —calls up Setup Menus; acts as Return or Enter key.

Use the arrow keys to scroll up and down to select the item. When the item is highlighted it is selected.

To return to the normal display

To return to the normal display, press the left arrow key until you return to normal display or select QUIT from the Main Menu, and then press the MENU key.

Checking the chart recorder

Check for unusual trends, such as regular cycling, that may indicate a pump control problem.

Changing the chart recorder disk

Change the disk if the chart recorder indicates the disk is 90% or more full in the lower right hand corner of the screen. The background will turn from green to red when the disk is full.

1. **Call up the disk menu.**
   Press theMENU key. From the MAIN MENU, select DISK and press the MENU key. From the DISK menu, select END RECORDING, and press the MENU key

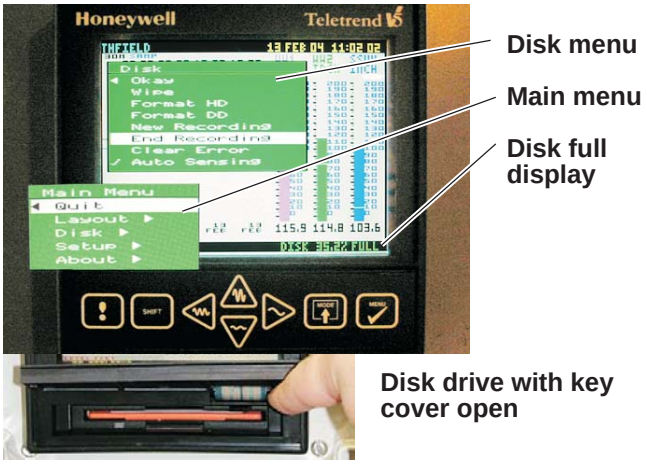
2. **Replace the disk.**
   Lift the disk door from the bottom, the key panel is on the door. Firmly press the eject button to the right of the disk drive, the disk should pop out. Gently push a new disk in the drive until it clicks, and stays in the drive. Close the disk door.

3. **Restart the recorder.**
   Select NEW RECORDING and press the MENU key. AUTO SENSING should have a check mark next to it.

4. **Return the recorder to the normal display.**
   a) Select OKAY to return to the MAIN MENU.
   b) Select QUIT leave the MAIN MENU.

   NOTE: If WRONG DISK appears on the display. Select DISK and press the MENU key. Select CLEAR ERROR and press the MENU key. Then Select NEW RECORDING and press the MENU key. AUTO SENSING should have a check next to it.

5. **A small number should appear next to DISK FULL right corner like 0-2% FULL**



Changing the disk on the chart recorder

How to replay data

Data can be replayed at any time, even while the unit is still recording. Data is recorded in sessions-each time you stop a recording, you end a recording session.

Before using any of the replay functions, be sure the recorder display is in TILED mode (i.e. split into sections for each pen). If you are in conventional mode (all pens on a single chart background), press the MODE key to go into TILED mode.

To replay data from the present time back to the start of the current recording session: Press the left arrow key The recorder will replay the data (using the tiled display format) backwards in time.

To replay data from the start of the current recording session: Press the right arrow key. The recorder will replay data forwards in time from the start of the current session.

To change the direction of replay: Press the up arrow key. This toggles between replaying data forwards and backwards in time.

To pause data replay: Press the down arrow key. The display will freeze at the exact point at which you pressed the key and a pause symbol will be displayed. To resume replay, press the down arrow key again.

To replay data from an earlier recording

Press the right arrow key to replay data from the start of the current session. Press the left arrow key to load up the previous session. Then use the normal replay functions.

Press the up arrow key to change the direction of data. When the start of the current session is reached the recorder will stop replaying data and the pause symbol will be displayed.

To exit from replay mode and return to normal display; press the MODE key.

To review alarms

A log of alarms is stored in the Events List, along with other events, such as Markers and the beginning and end of recording sessions.

To view the events list::

1. **Press the Softkey to call up the Quick Menu.**
2. **Use the down arrow key to highlight List Events.**
   The Events List will be displayed. Each event is marked with the time and date that it occurred and its description.

   If there are more events in the list that can be displayed on the screen the Events List will contain the most recent events.

   To view previous events keep pressing the up arrow key —the highlight will move to the top of the page, then the previous page will be displayed.

Troubleshooting the chart recorder

There is not alot you can do with the chart recorder. Using the reset, stop or restart the totalizer functions can sometimes create problems. If you have a problem contact maintenance.

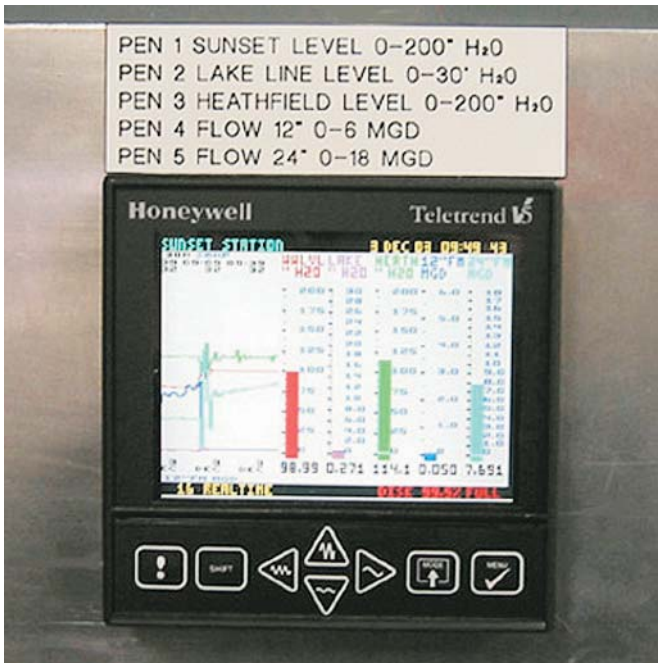
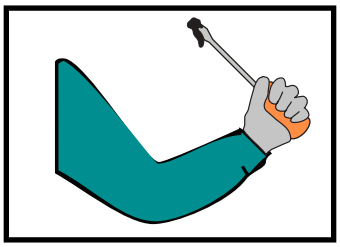


Chart recorder



2.3 Checking the Main Level

Checking the equipment catches small problems before they can become major failures. Maintaining the equipment prolongs its life. In addition to checking the equipment, you should also record the equipment run hours. The following checks are suggested from the checklist and the equipment manufacture's recommendation.

Checking the control room

1. Check the MCP.

a) On the alarm panel, acknowledge, troubleshoot and clear any alarms. Verify the equipment is now operating normally.

b) Check the pump sequence, change small and large leads if necessary. Verify that no locked out pumps are in lead positions. In wet weather conditions verify that both large pumps are working. If a large pump is down, notify maintenance. In float control only the large pumps are used.

c) Each pump HOA switch should be in AUTO, if not check the pump, verify it is working and put it in AUTO.

d) Check that PLC or REMOTE PLC are selected on the CONTROLLER SELECTOR, if not check that the PLC is running and if it is, change the selection to PLC.

e) Check that LEVEL is selected on the LEVEL SENS SELECTOR, if not check the wet well level. If the wet well level is below _____, check the bubbler. If the bubbler and the PLC or local LIC Moore controller are working, change the selection to AUTO LEVEL and push the button in the center of the CMC switch.

f) Check that the LOW LEVEL FLOAT SHUTDOWN switch is in AUTO.

2. Check the PLC.

Check the status of the PLC:

a) Check the annunciator panel for a PLC alarm.

b) Check the overview screen. If the numbers representing flow, level, and rpm looks like a string of asterisks (*****) rather then numbers then there is a communication failure with the PLC. Restart the PLC to clear the fault. If that doesn't fix the problem, then restart the PanelView. For more information on restarting the PLC, OIU and telemetry unit, see "Checking and Troubleshooting the PLC" on page 1-10

c) Check the PLC status screen. Look for green boxes labeled OK under the representation of each module.

d) Check the PLC modules. Open the cabinet housing the PLC. You should see nothing but green status lights on the modules. If you see a red light restart the PLC to clear the fault.

e) Check the telemetry unit. The telemetry unit is the blue box located at the base of the PLC cabinet. The row of red lights on the front of the unit flash when it sends data to south Plant. The unit only does this every couple minutes.

3. Check the wet well level.

Verify that the wet well level and the number of pumps running are consistent. If not, check the pumps.

4. Check the chart recorder.

Check for unusual trends, such as regular cycling, that may indicate a pump control problem. For more information on the chart recorder "Using the chart recorder" on page 2-4.

5. Check the station flow.

Verify that the flow is reasonable by considering the wet well level and the number of pumps running. If not, check the bubbler, and the pumps.

6. Check the Metotel RTU.

The ___ lights should be on.

7. Check the telephone is working

8. Check the UPS.

a) The lights in the diagram should be green.

b) The LINE INPUT, ALT LINE should be on and the INV OUTPUT and ALT LINE INV should be off. The INVERTER ON/OFF switch should be OFF.

9. Check the battery charger.

a) Check for a LOW BATTERY VOLTS light.

b) Check that the CHARGER POWER switch is on and the CHARGER INPUT light is on.

c) Check the batteries for leaks and missing plugs low level?.

d) Check that the charger output gauge reads about 10 amps.

e) Check that the battery volts gauge reads about 27 V DC.

10. Check the MCCs.

a) Verify any breakers that are not locked out or spare are on. Reset the breakers as needed.

b) Check for burning electrical smells and scorched cabinets.

c) Check that the lights indicate that the equipment is in the proper mode. A green light indicates that the equipment is ready to start. A red light indicates that the equipment is in operation.

d) Make sure that no BLOWN FUSE lights are on. If a light is on, remove the fuse holder by pressing it in and twisting it. Then replace the fuse and fuse holder.

11. Record equipment running hours and lead/follow designations at the MCCs.
Record the following information:

a) How many hours the C2 pump has run

b) Which C2HP pump is selected as lead

c) How many hours C2HP pump 1 and 2 have run

d) How many hours has each raw sewage pump has run (from the MCC) and the amp reading (at the pump control panel) if the pump is currently running

e) Which sump pump is selected as lead

f) How many hours sump pump 1 and 2 have run

g) Which instrument air (IA) compressor is selected as lead

h) How many hours IA compressor 1 and 2 have run

12. Check the MCC voltmeter .
The meter should read _____.

13. Check the transfer switches.
Verify the EMERGENCY STOP button is pulled out, and the HOA switch is in AUTO.

DO WE TEST THE SWITCHES AND THE GENERATOR EACH CHECKLIST?

14. Check the harmonic filters.
WHAT IS THERE TO CHECK

15. Check and wash the rectifier air filters????
Clean the rectifier filters each time you visit the station.

CAUTION

Make sure that the filters are completely dry before reinstalling them in the rectifier.

Do not contaminate the filters with oil or any other dust-absorbing material.

a) Remove the air filters from the rectifier.

b) Wash the filters in clean water.

c) Dry the filters thoroughly.

d) Reinstall the filters.

Checking the motor room

16. Check the wet well transfer fan.
Check the fans for noisy bearings, broken belts, or high differential pressure that would indicate the filters need changing. Change the filters or write up a work order as necessary.

17. Check the instrument air compressors.
The most frequent cause for IA compressor failure is a bubbler left in purge. Aside from disabling the bubbler, the constant demand for high pressure air places too great a load on the small IA compressors.

a) Verify the air dryer is turned on. Check the desacant is blue pink?

b) Check the air pressure. A normal reading is 70 to 80 psi.

c) Lock out the local STOP button for IA air compressors 1 & 2.

d) Bleed off the air from the receiver to less than 25 psi using the air/water bleed off valve at the bottom of the tank, lower right.

e) Wait for the alarm to register (about 30 seconds).

f) Unlock the STOP button on both compressors. The compressor should start and run until the pressure is 75 to 80 psi, and then stop.

g) Clear the alarm at the MCP.

h) Call the DCB and verify the alarm came in and is clear at the DCB.OR

i) Check the oil level? pressure ?with the dipstick and refill the crankcase to the lower edge of the filler hole if necessary.

j) Make sure that the Posidrain POWER ON switch is turned to ON. If not, check that it is plugged in. Drain air and moisture from the accumulators by turning the OFF TIME switch to TEST.

k) Once a month, check the inline air filter and clean it with a jet of compressed air if necessary. A clogged, dirty filter reduces the compressor's ability to fill the tank and contributes to premature wear of the working parts.

18. Check the ball valve hydraulic system.

a) Check that the system pressure is 1200 psi, and the emergency actuators are charged to _____.

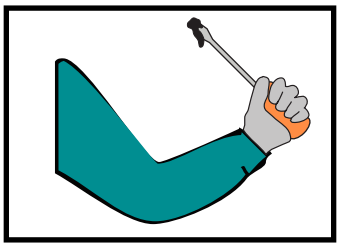
b) Check all flexible tubing and verify there are no leaks in the system.

19. Check the air gap or break tank.
Verify the automatic supply valve is keeping the tank full, but not overflowing.

a) Look inside the tank to ensure that the water level is about 4 inches below the overflow pipe. If the water is too high, call an electrician to adjust the control valve.

b) Check for rust and residue and flush the break tank as necessary.

20. Check the irrigation panel.



2.4 Checking the Pump Room

Checking the equipment catches small problems before they can become major failures. Maintaining the equipment prolongs its life. In addition to checking the equipment, you should also record the equipment run hours. The following checks are suggested from the checklist and the equipment manufacture's recommendation.

Checking the pump room

1. **Check the return air fans (F300,004).**
   Check the fan for noisy bearings, broken belts, or high differential pressure that would indicate the filters need changing. Change the filters and log the filter change or write up a work order as needed.

2. **Check the seal water pumps.**
   Check that the pumps are not running continuously. Push the TEST/LOCKOUT button for the C2HP pumps to ensure that the pumps are operating properly. If the pumps do not respond, check the breaker on the MCC and make sure the discharge and suction valves are both open.

3. **Record the C2 hydropneumatic tank pressure.**
   Check that the gauge on the pressure tank reads between 70 and 100 psi.

   If the pressure is lower than 70 psi (low alarm), test the C2HP pumps for proper operation. If the pumps operate normally based on the set point, try locking them out, then drain and recharge the empty tank. Allow the pumps to refill the tank to the normal range. If the tank will not hold the pressure above 70 psi, notify maintenance.

   If the pressure is above 100 psi, this means the lead pump is not stopping at the set point. Notify an electrician.

4. **Check the washdown pump.**
   Press TEST and see if the pump runs. It should stop when you release the switch.

5. **Check the sump pumps.**
   Verify the sump level and press the TEST button on each pump to see whether it comes on.

C2 Water Tank

   a) Verify the dry well float next to _____ is not blocked.

6. **Test the dry well sump alarm**

   a) Locate the float—it is on the lowest level (pump room), on the north wall at the east end of the sump.

   b) Lift up the float and hold it up for 30 seconds. The sump pump should start, and the alarm should register.

   c) Release the float. Check that it hangs freely. The pump stops as the level drops.

   d) Push the RESET button on the MCP to clear the alarm.

e) Call the DCB, verify the alarm came in and is clear.

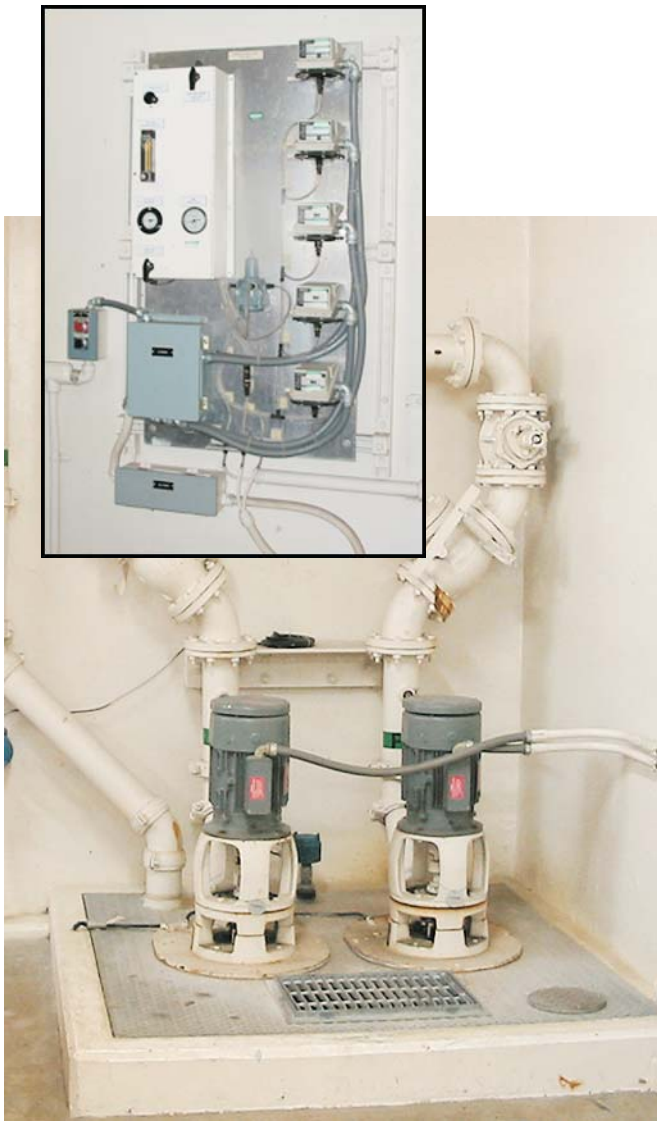
7. Pruge the sump bubbler

a) Check that the rotameter is operating at 0.8 scfh.

b) Push the plunger in as far as it will go.

c) Wait 30 seconds while the bubbler tube is purged. You can tell that the tube is being purged by the sound of air coming from the panel or by watching the rotameter float bounce in the sightglass.

Sump controls



Sump Pumps

NOTE: *If the bubbler is measuring the level of a liquid that is particularly thick or gritty, you may need to purge the bubbler tube for more than 30 seconds.*

d) Place the plunger in the detent position. The plunger should click positively into the detent position, which is about halfway between the purge position (fully depressed) and level-measuring position (fully extended).

e) Wait at least 15 seconds for the bubbler to stabilize and pressure to settle down. This prevents damaging shock to the diaphragm or bellows.

f) Pull the plunger all the way out. Failing to return the bubbler to the normal position will disable sump pump control and tax the IA compressors.

g) Recheck the rotameter reading. It should be 0.8 scfh.

8. Check the RSPs.

Check that the valving is correctly configured for the lead/follow selection.

Check the seal water is available for any pump that is not locked out. Verify the rotameter is set at _____; adjust as necessary.

Checking the rest room

9. Check that the toilet is not running.

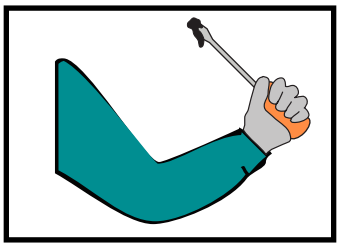
Jiggle the handle or write up a work order if you can not get the toilet to stop runnin.

Checking the HVAC room

Check the supply air fan (F330,221). Check each fan for noisy bearings, broken belts, or high differential pressure that would indicate the filters need changing. Clean the louvers if needed.

10. Check the HVAC control panel.

The panel should read _____.



2.5 Checking the Rest of the Station

Checking the equipment catches small problems before they can become major failures. Maintaining the equipment prolongs its life. In addition to checking the equipment, you should also record the equipment run hours. The following checks are suggested from the checklist and the equipment manufacture's recommendation. The wet well is a permit-required confined space. You must turn on the light, which turns on an additional fan, 30 minutes before you wish to enter the wet well. THIS FAN IS CURRENTLY LOCKED OUT IN THE ODOR CONTROL ROOM WITH A TAG THAT SAYS IT IS BECAUSE IT BLOWS TO THE ATMOSPHERE. THIS IS A SAFETY ISSUE CHECK WITH YOUR SUPERVISOR. Hang your meter inside the door, but do not step into the wet well.

Checking the odor control room

1. **Check the backflow preventer.**
   Check that the _____
2. **Check the fans.**
   Check the carbon filter fan (F330,225) and wet well exhaust fan (F330,224). Check each fan for noisy bearings, broken belts, or high differential pressure that would indicate the filters need changing. Change the filters or write up a work order as needed.
3. **Check the ORT tower.**
4. **Check the water heater is not leaking and has electricity.**

Checking the wet well

DANGER

The Heathfield Pump Station wet well is a permit -required confined space. Follow all King County confined space entry procedures and rules when entering the wet well.

5. **Turn on the light, check that the transfer fan came on. Wait 30 minutes before you enter the wet well.**
   When the light switch is turned on the exhaust fan comes on. NOTE THIS FAN IS CURRENTLY LOCKED OUT IN THE ODOR CONTROL ROOM
6. **Check the influent gates.**
   The slide gates should be in there hangers or neatly placed against the wall. If a gate is installed, notify your supervisor.
7. **Purge the bubbler.**
   This assembly is mounted on the bubbler panel (LX33__,33__), found inside the east door of the wet well. Normally 1.5 scfh is set on the rotameter. The air pressure is read at the gauge attached to the second, normally static, air tube on top of the bubbler pipe.

   a) Turn the two-position purge switch from to PURGE. Wait 30- seconds and return the switch to the up position.

CAUTION

If the switch is left in PURGE the bubbler is disabled, and the constant need for high-pressure purge air will tax the instrument air compressors.

Generator room

1. **Checking the generator**

   a) Verify all three Emergency-stops are pulled out, one in the station, one on the generator, and one on the generator control cabinet.

   b) Verify all three HOA switches are in AUTO, one on each ATS and one on the generator control cabinet.

   c) Verify there are no alarms or shutdowns displayed on the MICRO-PRO-1 controller located on the generator control cabinet.

   d) If there are alarms, scroll through the menus, clear each alarm and then reset each alarm by pressing the RESET

button until the yellow and red flashing indicators disappear.

e) Verify the 2000A generator breaker is closed.

f) Verify the STANDBY GENERATOR READY light is on.

g) If it is not on, check the bulb. If the bulb is all right, check again for alarms.

Weekly

1. **Check the battery fluid levels.**
2. **Check the generator oil and water levels.**
3. **Pump down and hose the wet well.**
4. **Check the outside lighting.**

   a) Check the HOA switch is turned to AUTO.

   b) Either turn the HOA switch to HAND or cover the photcell to check if the lights come on.

Monthly maintenance

Once a month, drain and flush the break tank by opening the drain valve. If the tank does not refill, notify maintenance.

Do not operate the rectifiers beyond 30 days without washing the filters. To clean the filters see_____

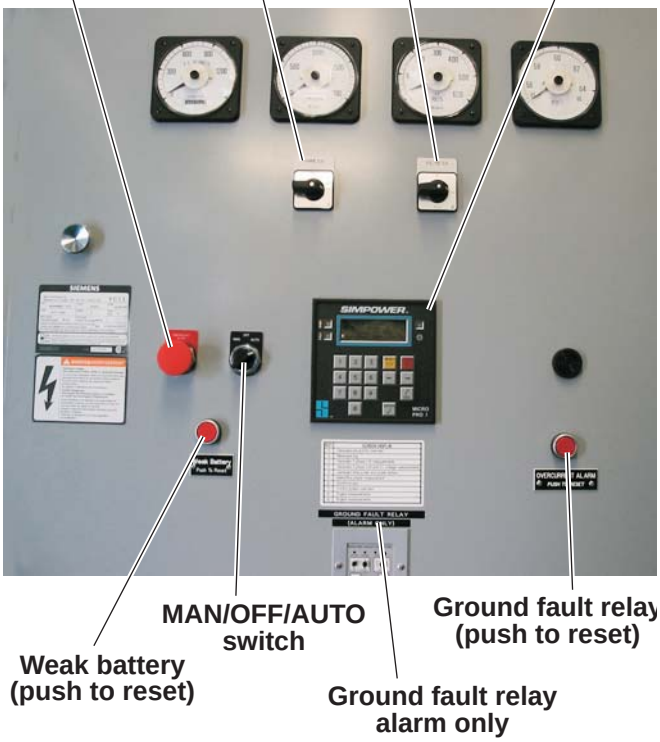
Quarterly maintenance

The hydraulic fluid should be tested quarterly. Abrasive substances in this fluid greatly accelerate wear and may lead to system failure and drastically increased maintenance costs.

Is the carbon in the ORT tested quarterly or anually??????

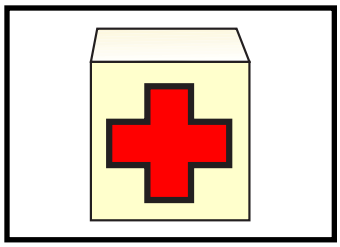
Anual maintenance

The backflow preventer should be tested at least annually. Write up a work order to have it tested.



Generator LCP

SECTION 3
Safety and Emergency Procedures



3.1 First Aid Rules

Familiarize yourself with the following basic first aid rules and precautions for handling blood and biological hazards in case of an emergency. When responding to an emergency, you should never endanger yourself for any reason.

First aid rules

- **Call for help immediately.** Call 911 immediately. Give the operator the station's address (3541 163rd Avenue SE, in Bellevue) and as much information as possible about the emergency. If possible, find some to call for you so that you can stay with any injured persons.
- **Notify South Plant DCB.** Always notify the DCB at (206) 684-2404 so that they can send a supervisor or another operator to assist.
- **Check before entering the area.** Always make sure it is safe to enter an area to help someone. Do not endanger yourself.
- **Be aware of potential dangers.** Be aware of the possibility of contacting or inhaling chemicals. Be aware of poisonous, explosive, or oxygen-deficient atmospheres.
- **Use the required personal protection equipment.** Wear the proper protective clothing to protect yourself from chemical hazards. You must wear and be trained in the use of a self-contained breathing apparatus in cases where inhalation of chemical vapors is possible.
- **Know first aid procedures beforehand.** Know basic first aid procedures as well as the proper first aid for the chemicals that you work with before an accident occurs.
- **Do not move an injured person.** Do not move an injured person unless he or she is in danger of further injury.
- **Take charge.** Administer first aid following the basic rules that you have been taught. If you have not had first aid training or are not sure what to do, find a qualified person.

DANGER

The effects of chemical exposures are not always immediately evident. Report all incidents and seek medical attention as soon as possible.

- **Take all injuries seriously.** Be aware that a person involved in an accident may be in (or may soon go into) shock and may not be thinking clearly. Do not let them downplay their injuries or avoid first aid.
- **Follow up.** When the emergency is resolved, fill out an accident/incident report. Remember that even minor injuries must be reported to your supervisor.

Precautions for handling blood and biological hazards

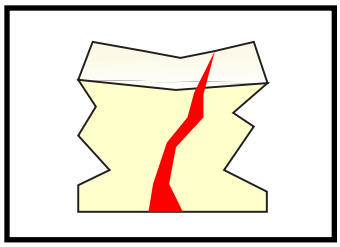
DANGER

Beware of contamination from blood and bodily fluids; they may be infected with AIDS, hepatitis or other serious diseases.

You cannot determine if someone is infectious by looking at them.

Use the following universal precautions:

1. **Always treat blood and bodily fluids as if they were contaminated.**
2. **Use latex or nitrile gloves and CPR valves to prevent exposure.**
3. **Clean up and disinfect all contaminated tools, surfaces, and clothing.**
4. **Properly dispose of contaminated wastes.** Follow the procedures outlined in the *WTD Bloodborne Pathogen Exposure Control Plan.*



3.2 Evacuation Procedures and Safety Equipment Locations

In the event of an emergency that requires evacuation, you should be familiar with the locations of all the exits from the station. You should also familiarize yourself with the locations of safety equipment such as fire extinguishers, fire alarm manual pull stations, the material safety data sheets, and first aid kit.

Evacuating the station

DANGER

Do not reenter the station under any circumstances, until the fire department determines it is safe to do so.

1. **Leave the station using the nearest safe exit.**
2. **Call 911.**
   Give the operator the following information:
   - Location: 3541 163rd Avenue SE, in Bellevue.
   - Nature of the emergency and whether chemicals, flammable liquids, or other hazardous materials are involved.
   - Any injuries
3. **Call the DCB at (206) 684-2404 and the the East Offsite Supervisor at (206) 684-240.**
4. **Wait outside for emergency response personnel to arrive.**
5. **Keep people away from the area.**

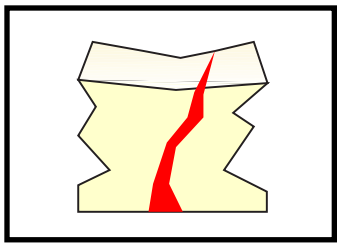
Safety equipment locations

The station includes the following safety equipment:

Fire extinguishers. Fire extinguishers are located throughout the station they are at the bottom of the stairs and near each man door.

NOTE: *See module 3.4 “Responding to Fires” on page 3-8 .*

First aid kit. A first aid kit is located _____.



3.3 Understanding and Responding to Hazardous Gases and Vapors

Hazardous gases and vapors may be present in the influent stream entering the station or they can form as a by-product. Hazardous gases and vapors can also result from the accidental release of chemicals stored at the station. You can be injured, suffocated, or killed if you inhale these gases and vapors. These gases and vapors are also dangerous because they can cause spectacular explosions and fires.

Sources of hazardous gases and vapors

Hazardous gases and vapors at the station can come from the following sources:

Releases into the influent. At anytime, without warning, volatile liquids could enter the influent stream as a result of chemical spills, illegal dumping into the upstream sewer system, or the malfunction of an industrial process. These liquids, such as gasoline and solvents, can produce toxic and explosive gases in wastewater conveyance systems.

Process chemicals. Hazardous gases and vapors can result from spills or leaks of chemicals used at the station. Chemicals used at the station include acid-impregnated activated-carbon, in the ORT.

By-product gases. By-product gases (sewer gases), vapors, and odors are the result of a complex series of chemical and biological reactions caused by the bacterial decomposition of organic matter. This can occur in sewer conveyance systems and collect in confined spaces. Dozens of gases can be found in the wastewater conveyance systems. One common gas is hydrogen sulfide, which is toxic and immediately dangerous to life and health at 300 ppm. In concentrations over 600 ppm, hydrogen sulfide can kill you. Appendix __ lists the other common gases with their characteristics.

Responding to hazardous gases and vapors

If you discover hazardous gases and vapors at the station, do the following:

DANGER

At least three trained persons wearing the proper protective equipment are required to verify an atmosphere trouble alarm.

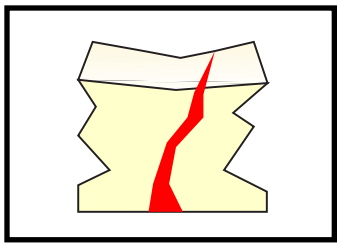
If outdoors, stay at least 100 feet from the release. If indoors, evacuate the station immediately.

Do not smoke.

Turn off all equipment in the area to avoid spark ignition.

Do not remove any manhole covers.

1. **Notify the DCB at (206) 684-2404.**
2. **Evacuate and secure the area.**
   Either mark the area with cones, flags, or tape. OR Have co-workers stand guard around the area.
3. **If possible, isolate and contain the release.**
   Close valves or shut down equipment as necessary.
4. **Shut down all ignition sources.**
   Possible ignition sources include motors, pumps, vehicles, and electrical equipment. Also do not smoke.
5. **Await further direction from Main Control.**
   Main Control will notify the on-shift operations supervisor, who will send an investigation team to determine the concentration of the gas or vapor and attempt to locate the source of the release.



3.4 Responding to Fires

You are not required to fight any fires. If you choose to fight a fire, you must be trained in the use of fire extinguishers and you may fight only fires that meet the criteria described in this module. Fire extinguishers are located throughout the station (See module 3.2 “Evacuation Procedures and Safety Equipment Locations” on page 3-4 for locations). Familiarize yourself with these locations in case of an emergency. If you discover a fire, call 911 immediately and notify the DCB.

Reporting a fire

Follow these procedures to ensure quick response to any fire:

1. **Aid injured persons.**
2. **Evacuate the station immediately.**

DANGER

Do not reenter the station under any circumstances, until the fire department determines it is safe to do so.

3. **Call 911.**
   Give the operator the following information:
   - Location: 3541 163rd Avenue SE, in Bellevue.
   - Nature of the fire and whether chemicals, flammable liquids, or other hazardous materials are involved.
   - Any injuries
4. **Notify the DCB at South Plant.**
   The phone number for the DCB at (206) 684-2404.
5. **Wait outside for the fire department.**
6. **When the fire department arrives, show them the locations of the fire hydrants.**
   Fire hydrants are located on the west side of the station near the tennis courts.

Fighting small fires

Under certain circumstances, you may attempt to fight a small fire with a portable fire extinguisher. Familiarize yourself with these procedures:

1. **Determine whether it is safe to fight the fire.**
   If **all** of the following conditions exist, you may attempt to extinguish the fire using a fire extinguisher. Otherwise, evacuate the area immediately and report the fire using the procedures in this module.
   - You have had fire extinguisher training.
   - The fire is small and is in its beginning stages. A fire that requires two fire extinguishers to fight is not considered small.
   - There is a readily available, safe route of exit.
   - The atmosphere is still relatively free of smoke and vapors.
   - The fire does not involve hazardous materials or flammable liquids.

DANGER

Never endanger yourself to fight a fire. If a fire gets out of control, leave the area immediately.

Do not use a CO2 (type B and C) fire extinguisher in an unventilated area. You could lose consciousness from oxygen deficiency.

Stand at least 8 feet away from the fire when using a fire extinguisher.

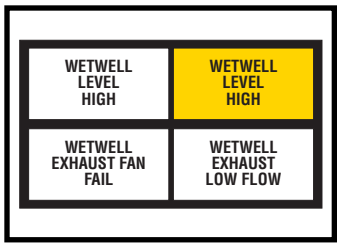
Leave the area immediately if toxic vapors, fumes, or smoke are present.

2. **Once you have confirmed that it is safe to fight the fire, locate an extinguisher and put out the fire.**
   a) Pull the pin.
   b) Stand at least 8 feet away and aim the extinguisher at the base of the flames.
   c) Squeeze the trigger while holding the extinguisher upright.
   d) Sweep the extinguisher from side to side to cover the area.

3. **If a second fire extinguisher is needed, then leave the area.**
   Do not continue to fight the fire.

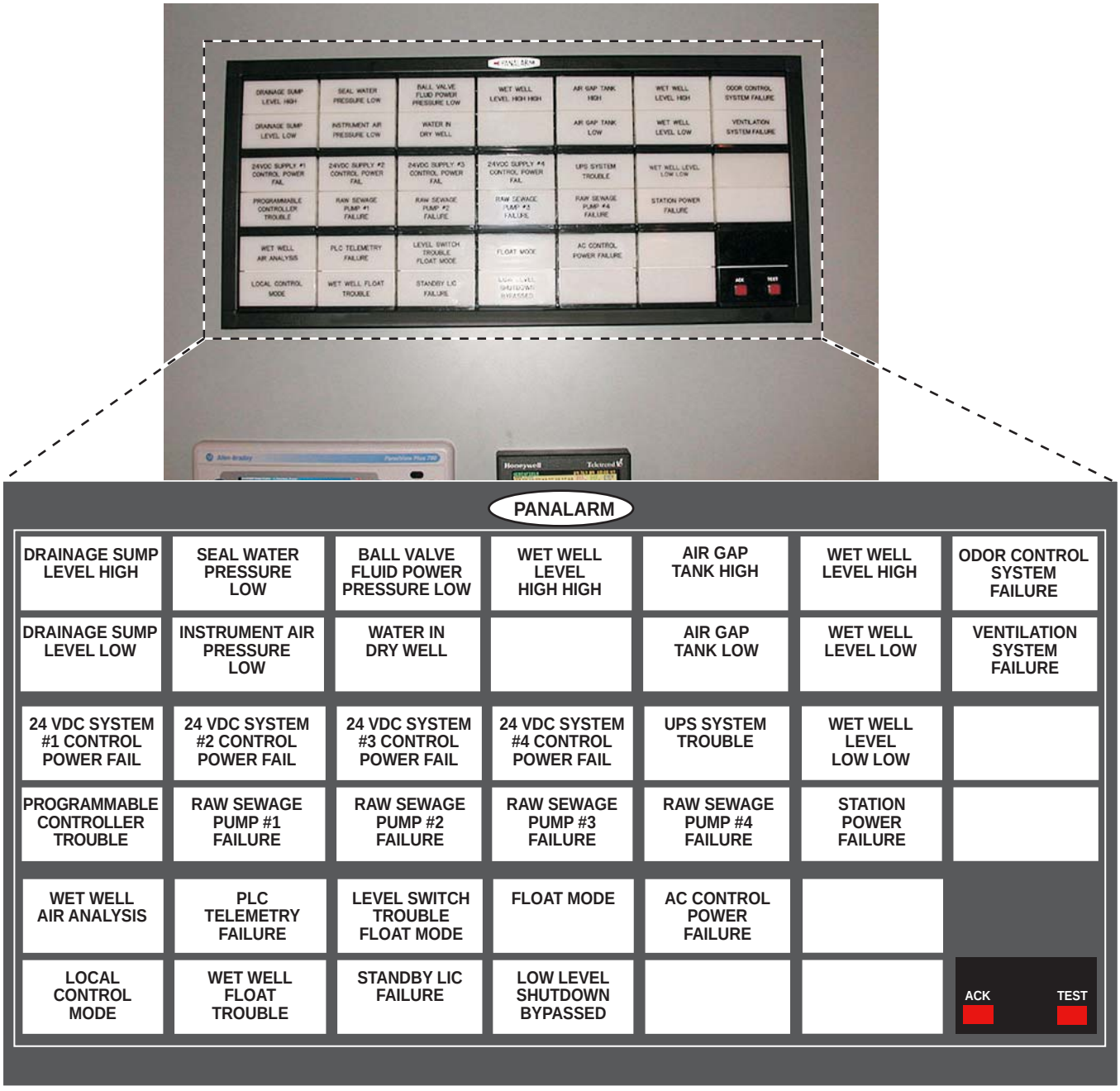
4. **If the fire gets out of control, or if toxic vapors or smoke form, leave the area immediately and call 911.**

SECTION 4
Alarms



4.1 Main Control Panel Alarms

The alarm system alerts you to problems at the pump station. An alarm annunciator panel is located on the main control panel. Some alarms are also transmitted using the MetroTel and CATAD systems to the Division Control Building (DCB) at South Plant. This allows Main Control to be aware of alarms at the pumping station shortly after they occur, even when the station is unoccupied. The DCB operator can also shut down the Sunset Pumps remotely if the Heathfield/Sunset intertie fails.



Alarm Panel

Some of the alarms, such as RAW SEWAGE PUMP 2 FAILURE, are summary alarms and have multiple causes. The specific reason for the alarm can often be determined at the local control panel. Details of the particular alarm are covered in the sections dealing with the associated equipment. A summary of causes, and troubleshooting information is in the table below.

Alarm	Possible causes	What to do
DRAINAGE SUMP LEVEL HIGH (LSH 330,005)	• Sump is at ___ inches incr. Failure of the sump pumps due to a clog, closed discharge valve, seal failure, or high motor winding temperature. • Sump pump(s) is turned off, bubbler left in purge, or power is off. • Excessive water entering the drainage system.	• Test the sump pumps. If only one pump works, select it as lead. If neither pump will work, notify maintenance immediately and install a temporary sump pump system, if necessary. • Check the bubbler control panel the purge knob should be push all the way in. The air supply should be 20 psi and the rotameter set at _____. • Check for a broken water pipe, open RSP drain or other source of excess flow into the sump.
DRAINAGE SUMP LEVEL LOW (LSL 330,005)	Sump is at 6 inches decr. Sump pump(s) has not shut off.	Check the compressor system is supplying the bubbler. Purge the bubbler. Test the pump that was running and see if it shuts off on set point. If the pump does not stop or the pump(s) are burned up write up a work order.
SEAL WATER PRESSURE LOW (PSL 330,013)	C2HP pressure is less than 70 psi decr., shuts down the RSPs or prevent them from starting. RSP 3 will run in fill-and-draw. Seal water pumps have failed or there is a broken pipe.	The seal water pressure must be about 10 to 15 psi higher than the pump head to prevent grit from infiltrating the seal. • Test the seal water pumps, if only one works select it as lead and see whether it will keep the pressure up. If neither pump works, notify maintenance immediately. • Check for a break in the line. • The bladder in the tank has failed and the pneumatic tank is water logged.
INSTRUMENT AIR PRESSURE LOW (PLS 330,113) (INSTR AIR PRES LOW MetroTel)	Pressure inside the air receiver tank has dropped below ____ psi. Also indicates the follow compressor has come on.	1. If no compressor is running, test the lead and follow compressors. Select the running compressor as lead. If a breaker is open, close and press the RESET button on the switchgear, if it trips again write up a work order. 2. If the compressors are running continuously make sure the receiver manual and automatic drain valve are closed. Verify the bubbler has not been left in PURGE. 3. Check for a leak in the lines.
BALL VALVE FLUID POWER PRESSURE LOW (PSL 330,101) (BALL VALVE HYD PRES LOW MetroTel)	The hydraulic system does not have enough pressure (1,050 psi resets at 1,100 psi; MetroTel III at 500 psi) to open/close the RSP discharge valves. The RSPs are stopped, the emergency accumulators close the valves. Must be manually reset at the MCP before the RSPs will restart.	• Test the lead and follow hydraulic pumps, at least one should be running. Select the running pump as lead. If neither pump will run notify maintenance immediately. • If the pumps are running continuously look for a leak in a line. • Check the log to see if work has been done on the pumps recently.
DRY WELL FLOOD (330.330A) (MetroTel PUMP ROOM FLOODED or DRY WELL FLOOD)	Float switch near_____ has floated. Shuts down all the RSPs.	Approach the motor room with caution—there could be a sump overflow or a major line break. Check where the water is coming from and isolate the source. If there is no water, check that the float is free to move.

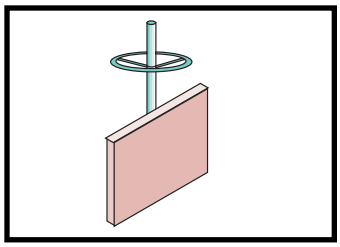
Alarm	Possible causes	What to do
WET WELL LEVEL HIGH HIGH (LSHH 330,156) (WET WELL HI/LO MetroTel)	The wet well has reached 200 inches; elev 161.4 ft. Sunset's pumps should have stopped at 165 inches and stopped the influent. All pump controls have failed, all the pumps have failed, and/or there is local flooding into the wet well.	• If the Sunset/Heathfield intertie has failed, have the DCB shut down the Sunset pumps from Forney. • If the PLC and local LIC controller have failed, the floats will be enabled at188.64 inches, check that the large pumps are ready to run. • If you want the floats to take over sooner, verify there is control power, then select FLOATS on the LEVEL SENS SELECTOR. The large lead starts,at 171.6 inches; elev. 159 ft.
AIR GAP TANK HIGH (LAH-330,431) AIR GAP TANK LO (LAL-330,431)	The floats in the break tank (mfg set) have tripped. City water is turned off, supply valve has failed, or there is a leak in the system. On low RSP 3 will run in fill-and-draw.	If the tank is low, be sure the city water supply is open. Check the automatic fill valve on top of the tank verify it opens and closes properly. If the fill valve is working, check for leaks in the C2 and C2HP systems or that a drain valve has not be left open. The high level is about 4 inches below the overflow. If the level is too high, write up a work order to have it adjusted.
WET WELL LEVEL HIGH (LSH 330,155)	The wet well is at 183.6 inches; elev.160 ft., this has enabled float control of the RSPs. Only the two large pumps will run. The PLC and the LOCAL LIC have failed, or the RSPs could not keep up with the influent flow rate.	• The Sunset/Heathfield intertie has failed, have the DCB shut down the Sunset pumps from Forney. They should have been stopped at 165 inches; elev.158.45 ft. • If the PLC and local LIC controller have failed, the floats will be enabled at188.64 inches, check that the large pumps are ready to run. • If you want the floats to take over sooner, verify there is control power, then select FLOATS on the LEVEL SENS SELECTOR. The large lead starts,at 171.6 inches; elev. 159 ft. • Verify the large pumps are running and handling the flow. *NOTE: If you must start a small pump for any reason under float control, the large pumps can not be in AUTO or ta small pump will not start. The flow must be limited to 15 mgd leaving Heathfield.*
WET WELL LEVEL LOW (LSL330,330)	The low bubbler set point has tripped at 72 inches; elev. 150.7 ft. The pumps are stopped.	The last pump should have stopped at 80-inches; elev. 151.36 ft. Check why the pump did not stop.
ODOR CONTROL SYSTEM FAILURE	Carbon filter fan (F 330,425) has failed. Indicated by no air flow through the odor control duct.	Check the fan control panel and switchgear to verify the fan has power and can run. There is anOFF/RUN switch and a RUN light on the MCC. Test the fan using the local TEST button on the wall of the odor control room. *NOTE: The carbonfilter fan blows the normal wet well exhaust through the carbon ORT. There are manual valves to route this exhaust to the atmospher, contact your supervisor before exhausting untreated air.*

Alarm	Possible causes	What to do
VENTILATION SYSTEM FAILURE	The wet well supply or exhaust fan has failed. If there is not enough pressure differential by a differential pressure switch in the discharge duct, an alarm registers.	Check the wet well supply and exhaust fan, the return fan has an OFF/RUN switch at the MCC. Both fans have LOS and TEST buttons locally. ***DANGER*** *If either fan fails, the wet well is then considered a permit-required confined space. You may not enter without a permit. Evacuate the wet well immediately and notify South Plant Main Control.*
24 VDC SYSTEM NO.1, 2, 3, 4 CONTROL POWER FAIL	One or both of the 24V DC power supplies located in the main control panel has failed.	In panel CPP 330,206: For 1 check CKT 2 For 2 check CKT 3 For 4 check CKT 7 For 4 check CKT 8 Reset the breaker once, if it fails again call the instrument shop immediately. If these DC power supplies fail, so do the level transmitter, speed transmitters and discrete inputs for PUMP RUNNING to speed controllers. The speed controllers also control the discharge valves.
PROGRAMMABLE CONTROLLER TROUBLE (PLC FAILED MetroTel)	The PLC (programmable logic controller) has failed.The raw sewage pumps will automatically switch to backup level control.	Check that the LOCAL LIC Moore controller is working properly. Check CKT 1 in panel CPP 311,206, reset the breaker once if necessary. If the breaker trips again, call maintenance with a work order for the PLC.
RAW SEWAGE PUMP NO 1, 2, 3, 4 FAILURE	VFD fault, high motor winding temperature, broken pump shaft.	Visually inspect the pump shaft, if it is fine reset the drive fault. Clear the fault at the VFD, then press the RESET VFD button for the pump on the MCP.
UPS SYSTEM TROUBLE (UPS FAILE MetroTel)	There is a problem with the uninterruptible power supply.	Reset the UPS by _____
WET WELL LEVEL LOW LOW (LALL 330, 151) or bubbler? (WET WELL HI/LO MetroTel)	The wet well is 69.6 inches; elev. 150.5 ft.The low low level has been reached the pumps did not stop at low level. There is another stop signal at this point.	• Verify the wet well level, and that no RSPs are running. If a RSP is still running shut if off. The small lead (operated in PLC or local LIC) should have stopped at 80-inches; elev. 151.36 ft. The large pumps under float control should have stopped at 145 inches; elev. 156.8 ft. • Check the bubbler system. • Check which level controller was operating the pumps and switch to the other controller, write up a work order on the controller that did not seem to shut down the pump correctly. Wait and see that the other level controller start and stops the pumps at set point. You select a different controller on the MCP using the LEVEL SENS SELECTOR switch.

Alarm	Possible causes	What to do
STATION POWER FAIL (UTIL PWR PHANTOM LAKE FAILED or UTIL PWR EASTGATE-13 MetroTel)	One of the 12.5 kV feeders to the station has failed, the emergency generator should start automatically.	Verify the ATS switch has started the generator. Contact your supervisor if the generator did not start. One large pump can handle the normal station flows. Check the generator fuel level. Request a fuel delivery if necessary. If the feeder is back up, it will take 15 minutes before the ATS will transfer power back to the feeder, the generator will still continue to run after the power transfer until the engine has cooled down. Verify the complete transfer sequence before leaving the station if posible. *NOTE: The Eastgate feeder A powers the odd numbered equipment; the Phantom Lake feeder B powers the even numbered equipment and lighting.*
WET WELL COMBUSTIBLES HIGH (AIT 330,401)	The LEL sensor in the wet well has detected 10% LEL.	Check that the wet well supply and exhaust fan are working, open the door to the wet well only enough to turn on the light switch and place the sample pump hose in. Verify the LEL level with your monitor. Notify your supervisor if the LEL is high, allow the wet well to ventilate. *NOTE: LEL is the explosive limit of combustible gas, it does not indicate low oxygen levels.*
LOCAL CONTROL MODE	The RSPs are running in LOCAL LIC, either because of PLC failure or LOCAL LIC has be selected at the CONTROLLER SELECTOR switch.	• See PROGRAMMABLE CONTROLLER TROUBLE above. • Check which controller has been selected, contact your supervisor before making any changes if the RSPs are running normally.
PLC TELEMETRY FAILURE	The MetroTel or SCADA (Forney) system has failed or intertie has failed, DCB operator should monitor wet well levels and shut down Sunset pumps if necessary.	Both systems use leased phone lines. Verify control power to the units, if the units have power contact the phone company. If the units do not have power _____. Check CKT 4 in CPP 310,206.
FLOAT SWITCH TROUBLE (MetroTel only) (LSHH 330,156) HEATHFIELD WET WELL HIGH at Sunset PS The cause is unclear from the dwgs on Heathfield. At Sunset this was the Hi Hi float alarm	The float control system has failed. The wet well is at 200 inches; elev. 161.42 ft. The ceiling of the wet well is elev. 175 ft.; the grating is elev. 163 ft.; the overflow is at elev.159 ft.	Stop the Sunset pumps. At South Plant, contact pump run to find out why three control systems have failed. Pull up the Sunset screen on Forney and verify the problem. Shut down the Sunset pumps if they are still running. Select the SHUT DOWN button and pressing the right mouse key and reset by selecting NORMAL and pressing the right mouse key. The shutdown is reset at Sunset Pump Station by pressing the SOUTH TREATMENT PLANT reset button on the MCP. Start watching the lake line or Issaquah interceptor level. The interceptor is high at elev. 21 feet and overflows at 186 inches, elev. 160.25 ft.
LEVEL SENSOR TROUBLE (LEVEL SWITCH TROUBLE FLOAT MODE MetroTel)	The RSPs are running in float control, the PLC and LOCAL LIC have failed and the wet well has hit 188.64 inches; elev. 160.42 or someone has selected FLOATS on the LEVEL SENS SELECTOR switch on the MCP.	Contact pump run and have them check why the PLC and LOCAL LIC have failed. In float control both large pumps are used. One large pump normally is enough to handle average wet weather flows. Check the flow, the PLC and LOCAL LIC normally limit the discharge from Heathfield to 15 mgd to prevent local flooding near the Eastgate discharge structure.

Alarm	Possible causes	What to do
LEVEL CONTROLLER FAIL (STANDBY LIC FAILURE MetroTel)	The PLC and LOCAL LIC controllers have failed or LOCAL LIC control was selected and has failed and the RSPs are now running on float control. Float control is enabled at 188.64 inches; elev. 160.42.	Contact pump run. Pull up the Heathfield screen on Forney and verify that once the wet well is above 171.6 inches; elev. 159 ft. the large lead pump starts. Normally only one pump will be needed but the large follow pump should start at 183.6 inches; elev. 160 ft. Both pumps will stop at 145 inches; elev. 156.8 ft. Check the flow, the PLC and LOCAL LIC normally limit the discharge from Heathfield to 15 mgd to prevent local flooding near the Eastgate discharge structure.
FLOAT MODE (MetroTel only)	The PLC and LOCAL LIC controllers have failed or someone has selected FLOATS on the LEVEL SENS SELECTOR on the MCP.	See above.
LOW LEVEL SHUT DOWN BYPASSED	The LOW LEVEL FLOAT SHUTDOWN switch has been turned to BYPASS.	The switch should reset at 69.6 inches; elev. 150.5 ft. If possible, turn the LOW LEVEL FLOAT SHUTDOWN switch back to AUTO. Leaving it in BYPASS will allow the pumps to run dry.
AC CONTROL POWER FAILURE (LOSS OF CONTROL POWER MetroTel)	The power transformer that supplies CPP 310,206 has failed or the Phantom Lake feeder has failed and the generator did not start. There is no control power. Contol power panel on UPS. After 20 minutes, there will be no alarms and the RSP 24 V power supplies will not work.	Contact Maintenance immediately. It is possible to power both MCCs from one feeder using the tie breaker. However Puget Sound Energy must be notified, contact you supervisior.
SPARE		
POWER FAIL ACK/ALARM RESET/ TEST	LAP panel fuse blown, or station 120 V power out.	Check CKT 5, CPP 311,206, reset it once, if it fails again call the instrument shop immediately.

SECTION 5
Influent Control



5.1 An Overview of Influent Control and Wet Well

The influent control system regulates the flow of wastewater into the pump station. Operating the influent control system correctly reduces the threat of flooding the pump station, and can minimize how much wastewater needs to be released into the environment. Because Sunset Pump Station is a lift station for Heathfield Pump Station the storage for the influent is the upper end of the Issaquah interceptor. The interceptor has two manually operated flushing structures, and one emergency overflows equipped with flap gates. Since Sunset Pump Station's forcemains pump directly into the Heathfield wet well the Sunset forcemains are most of the influent system. The influent is not controlled. Two normally open slide gates can be manually slide into place to isolate the wet well from one or both of the forcemains. There is one 10-inch local sewer that enters the wet well from the south. The wet well level is measured by a bubbler, and has an overflow system. The raw sewage pumps draw influent from the wet well and discharge it to the Eastgate trunk sewer.

Influent flows

One 12-inch and one 24-inch forcemain comes directly from the Sunset Pump Station and empties into the Heathfield wet well. The 12-inch forcemain opens up to 24-inches just before it enters the wet well. Two normally open, manually placed slide gates can be used to isolate the wet well. The influent enters the station from the west end of the wet well. A 10-inch local sewer enters the wet well from the south near the east end. These are the only flows that enter the wet well. The Heathfield sanitary sewer system empties into Sunset Pump Station through an 8-inch sewer line. The roof and storm drain all empty into a stormwater system.

Ten-inch sewer Flow measurements. A 10-inch Palmer-Bowlus fiberglass reinforced plastic flume is installed on the end of the small sewer pipe to produce a flow head relationship that can be measured. The sewer enters the wet well about 3 feet below the grating. A Drexelbrook capacitance/resistance electronic unit is mounted on the flume to convert the wastewater depth to a corresponding flow. This flow is indicated and recorded at the MCP[1].

Overwhelming Heathfield Pump Station

Although it is unlikely, a partial blockage of the Heathfield pump suction or discharge lines, a control loop malfunction, or mechanical problems could cause the Sunset Pump Station to overwhelm the Heathfield pumps. Because Heathfield Pump Station is surrounded by houses, it is important that it does not overflow

While the raw sewage pumps (RSPs) at Sunset Pump Station normally operate based on Sunset's wet well level, if the Heathfield wet well level is high-high, the Sunset pumps are first slowed and then stopped to prevent overwhelming the Heathfield Pump Station and causing an overflow. This override depends on the intertie between the two stations. If the intertie fails, the DCB operator at South Plant can also shut down the Sunset pumps. (Both stations overflow to Lake Sammamish).

Wet well overflow system

The wet well is about 39 by 8 1/2 ft. and 19 ft. deep (to the grating). The influent invert is below the bottom of the wet well at elev. 141 ft..

The Heathfield wet well has an 18-inch overflow line set at 159 inches (34 inches below the wet well grating). The wastewater that enters this overflow line flows to manhole 6, located at the end of the Heathfield driveway, and into the 8-inch local sewer line. This sewer line, now 12-inches, ends at MH R 17-9 where it joins a 10-inch local sewer that runs north along West Lake Sammamish Pkwy. SE. This manhole empties into MH R17-11 where it is joined with flow from the Vasa Park local sewer. This manhole empties into the Sunset Pump Station manhole structure and into the wet well, along with the flow from the Issaquah interceptor.

1. The new control panel does not show this flow, it may be int the INFLUENT FLOW total.

Any flow from Heathfield that cannot be handled by this 8-inch local sewer line flows back up into an underground 54-foot long, 48-inch diameter stormwater detention basin at Heathfield. The detention pipe overflows to a 48-inch highway storm drain in Southeast 38th Street and into a 48-inch storm drain line under the dock at Sunset Pump Station where it flows into Lake Sammamish.

Issaquah interceptor as storage

The lssaquah interceptor is part of the storage system for the Heathfield Pump Station. There is about 0.75 mgd storage capacity in the interceptor or about 24 hours of dry weather storage. There is no storage capacity for Heathfield Pump Station. The lssaquah interceptor is equipped with an emergency overflow structure (MH RI 7-29). This structure has flap gates that protect the Sunset wet well from overflowing.

Influent slide gates

The influent slide gates (330,SLG01/02) are normally stored in racks on the wall of the wet well. When used they are slide into slots in the wet well. Wet well

Wet well bubbler

The bubbler panel (LX330,330), which includes the air set, air purge assembly, and high pressure purge valve, is mounted on the north wall of the wet well near the west end of the grating walkway.

The PLC and LOCAL LIC control of the RSPs depend on the wet well bubbler and level transmitter. The instrument air system supplies the bubbler at 20 psi air. The bottom of the bubbler is at elev. 144.7 ft. about 1.2 feet from the floor of the wet well. Its range is 0 to 200 inches. The top range is about 1.6 feet below the grating.

A bubbler measures the liquid level in the wet well. A bubbler works by constantly releasing a air from the bottom of a bubbler pipe which keeps the pipe full of air. The air pressure within the pipe is proportional to the liquid level.

Purge assembly. The purge assembly for the bubbler is on the bubbler panel (LX330,330), found in the north corner of the wet well. An air flow rate of 1.5 scfh is normally set on the rotameter. This air pressure is read at the gauge attached to the second, normally static, air tube on top of the bubbler pipe. Two level-indicating transmitters are also on the panel. To purge the bubbler, turn the two-position switch from NORMAL to PURGE, wait and then return the switch to NORMAL.

CAUTION

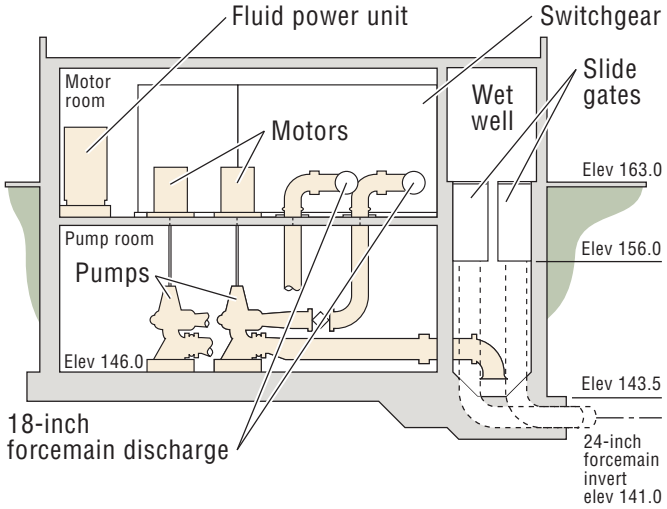
If the switch is left in PURGE the bubbler will be disabled and the constant need for high-pressure purge air will tax the instrument air compressors.

Wet well floats

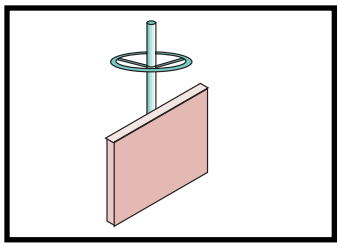
Four floats operate the raw sewage pumps when the bubbler or automatic control systems fail. These floats only operate the large pumps.

One low low level float LSLL330.151 will stop all pumps and prevent them from starting. This also sends a MetroTel alarm.

One high high level float LSHH330.156 will signal a float control system failure. This indicates that the wet well is above all pump control set points and is overflowing. This also sends a MetroTel alarm. The Sunset pumps should be stopped as soon as posible. This can be done from the DCB.



Heathfield pump station cross section



5.2 How Influent Control Works

The pump station has two manually operated slide gates to isolate the wet well for maintenance. The wet well bubbler and floats control the raw sewage pumps at Heathfield and at high level also control the Sunset Pump Station raw sewage pumps through the intertie between the stations. The wet well monitoring and ventilation systems help maintain a safe working environment in the wet well.

Control strategy

Influent gate. The influent gates are normally open slide gates.

Overflow. An 18-inch overflow line set at elev.159 ft. The wastewater that enters this overflow line flows to the Sunset Pump Station manhole structure and into the wet well.

Any flow from Heathfield that cannot be handled by this 8-inch local sewer line flows back up into an underground 54-foot long, 48-inch diameter stormwater detention basin at Heathfield. The detention pipe overflows to a 48-inch highway storm drain in Southeast 38th Street and into a 48-inch storm drain line under the dock at Sunset Pump Station where it flows into Lake Sammamish.

Wet well ventilation. In AUTO, the wet well transfer fan and the carbon filter fan run continuously. Normally, the transfer fan runs at slow speed. When the wet well light is switched on, the wet well transfer fan speed is doubled (fast speed) and the wet well exhaust fan is started. When the wet well light is turned off , the reverse happens.

LEL. There is a wet well LEL sensor, an alarm registers at 10% LEL.

Control options

Influent gate. The gates can manually slide into place. They are normally stored on the walls of the wet well.

Wet well bubbler. There is one 0-200 inch range bubbler. The bubbler system is used by the PLC or LOCAL LIC to control the RSPs. It has a purge, detent, and normal setting and a rotameter. The bubbler recieves air from the IA system. It is regulated to 20 psi locally.

Wet well floats. A series of float switches installed in the wet well operate a RSP control strategy when the PLC or LOCAL LIC fail or when float control is selected.

Wet well ventilation. Because of the low volume of air flow, the wet well is always considered a permit-required confined space even when the supply and exhaust fans are running. Use your meter to test the air before entering the wet well.

Wet well transfer fan. The wet well transfer fan is a two-speed unit, it has a HAND/OFF/AUTO (HOA) switch and a SLOW/FAST switch on MCC B. A STOP/TEST and SLOW/FAST pushbutton station is next to the fan in the wet well.

When the speed selector switch is set to FAST, the fan runs at high speed whenever it operates; this can be over ridden by the local pushbuttons. (The transfer fan always runs at high speed if the TEST and FAST pushbuttons are pressed.)

When the speed switch is set to SLOW, fan speed depends on the position of the HOA switch and whether the wet well exhaust fan is running. In HAND, it runs at low speed. In AUTO the transfer fan runs at low speed when the wet well exhaust fan is not running, and fast when the well exhaust fan is started. The SLOW/FAST switch on the MCC remains in SLOW and transfer fan returns to slow speed when the exhaust fan is stopped.

Wet well exhaust fan. The fan has a local manual motor-starter mounted on a wall near the fan in the odor control room. Normally this switch is ON. The fan is started and stopped by the light switch inside the wet well access door; the fan turns on and off with the light.

Ten-inch sewer flow. This flow is indicated and recorded at the MCP.[1]

Alarms and interlocks

Low wet well level RSP interlock. The low low float switch stops all pumps and prevents them

1. The new control panel does NOT show this total.

from starting, a LOW LEVEL FLOAT SHUT-DOWN override switch on the MCP in BYPASS will allow you to restart a pump or pump down the wet well.

- VENTILATION SYSTEM FAILURE—The wet well supply or exhaust fan has failed. If there is not enough pressure differential by a differential pressure switch in the discharge duct, an alarm registers.
- WET WELL AIR ANALYSIS (AIT 330,401)—The LEL sensor in the wet well has detected 10% LEL.
- WET WELL LEVEL HIGH (bubbler or LSH 330.155?)—The wet well is at 183.6 inches; elev.160 ft., this has enabled float control of the RSPs. Only the two large pumps will run.
- WET WELL LEVEL HIGH (LSHH 330,155) or WET WELL LEVEL HI/LO MetroTel—The wet well has reached 200 inches; elev 161.4 ft. Sunset's pumps should have stopped at 165 inches and stopped the influent. All pump controls have failed, all the pumps have failed, and/or there is local flooding into the wet well.
- WET WELL LEVEL LOW (bubbler or LSL330.152????)—The low bubbler set point has tripped at 72 inches; elev. 150.7 ft. The pumps are stopped.
- WET WELL LEVEL LOW LOW (LSLL 331,151) or WET WELL LEVEL HI/LO MetroTel—The wet well is 69.6 inches; elev. 150.5 ft.The low low level has been reached the pumps did not stop at low level. There is another stop signal at this point.
- WET WELL HIGH HIGH (LSHH 331,156)—The wet well has reached 200 inches; elev 161.4 ft. Sunset's pumps should have stopped at 165 inches and stopped the influent. All pump controls have failed, all the pumps have failed, and/or there is local flooding into the wet well.
- FLOAT SWITCH TROUBLE (MetroTel) (LSHH 331,157)—The float control system has failed. The wet well is at 200 inches; elev. 161.42 ft. The ceiling of the wet well is elev. 175 ft.; the grating is elev. 163 ft.; the overflow is at elev.159 ft.

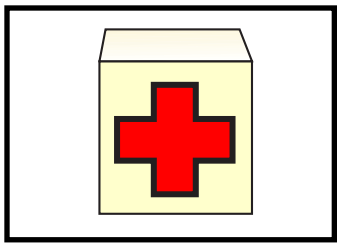
Lockout locations

The fans are locked out at the MCC. There is a local disconnect of the wet well exhaust fan in the odor control room. It is currently locked out because it discharges to the atmosphere if the wet well lights are left on, and the lights are currently left on.[1]

Power outage

Wet well ventilation. When MCC B is not running normally from utility power, the fans will not start. The fans must be manually reset after power is restored. Reset buttons are located on the local control panels.[2]

1. THIS defeats the purpose of this fan it would be better to turn the wet well lights on just when it is being used and have this fan on unless there are too many complaints.
2. Ture????



5.3 Working Safely in the Wet Well

Safety is the most important consideration when entering or working in the wet well. The enclosed space surrounding the open tank of wastewater makes the wet well a hazardous place to work. A properly operating ventilation system and safety monitoring are important to maintaining safe working conditions in the wet well. This module covers these systems.

DANGER

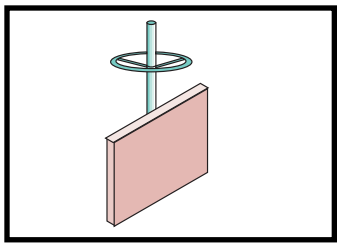
Always check the ventilation system is working properly and check the LEL meter.

Because of the low volume of air, the wet well is a permit-required confined space, and considered dangerous at all times.

Wet well safety systems include the exhaust, transfer, and supply fans, the high level float switches and the LEL monitor. There is a sample pump on the work bench that is used with your monitor to check the wet well before entering.

Entering the wet well

1. **Check the main control panel for a WET WELL AIR ANALYSIS alarm and any wet well high alarms.**
2. **Turn on the light in the wet well and wait 30 minutes.**
   In AUTO, the wet well transfer fan and the carbon filter fan run continuously. Normally, the transfer fan runs at slow speed. When the wet well light is switched on, the wet well transfer fan speed is doubled (fast speed) and the wet well exhaust fan is started. When the wet well light is turned off , the reverse happens.
3. **Use the sample pump and test the air in the wet well.**
   Continuously monitor the air quality inside the wet well for hydrogen sulfide, explosive gases, and oxygen content.



5.4 Operating the Influent System

Safety is the most important consideration when entering or working in the wet well, see “Entering the wet well” on page 6. The bubbler and floats are used to control the raw sewage pumps, the influent gates are used to isolate the wet well for maintenance. The bubbler and wet well floats are in the wet well. The wet well is entered from the outside through one of two doors on the south side of the building. The bubbler control panel is mounted at the east end of the wet well the slide gates are on the west end. The local influent sewer and wet well overflow have no controls.

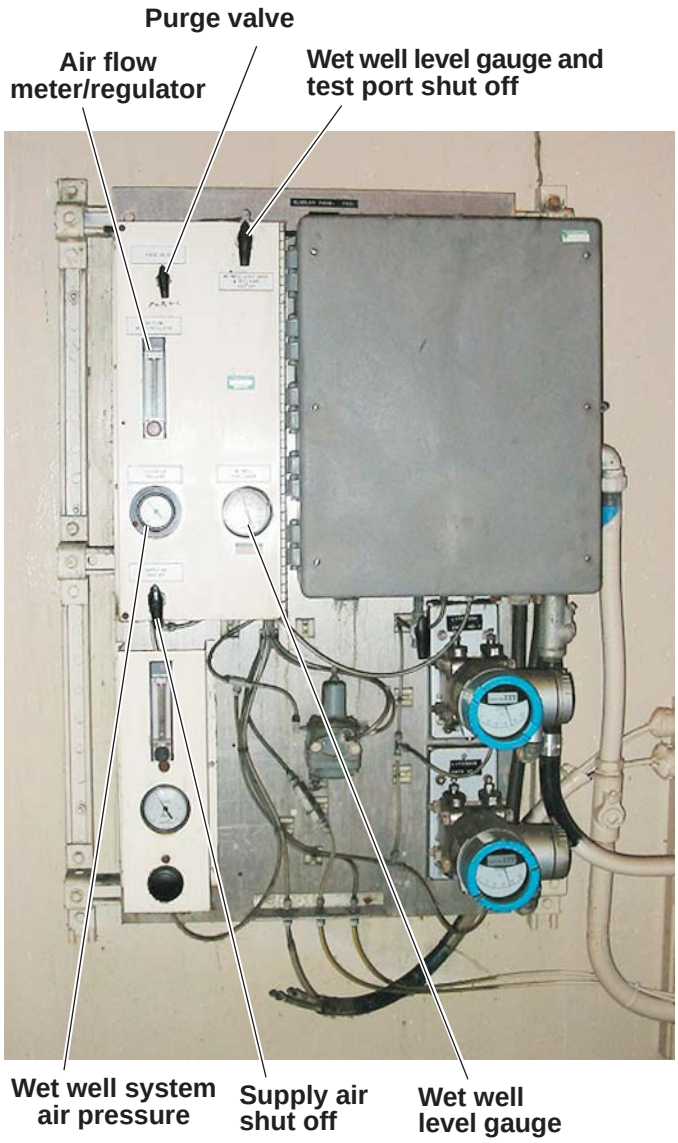
Purging the wet well bubbler

1. **Turn the purge switch downward to the halfway down or detent postion for 3 seconds.**
2. **Turn the switch until it points down (fully open). Purge for 15 seconds.**
3. **Turn the purge switch halfway up to the detent position for 3 seconds, then turn it straight up (fully closed).**

Checking the high wet well alarm

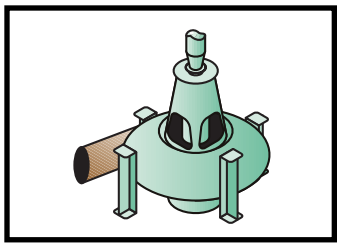
Generally, the high wet well alarms are tested after the wet well has been pumped down and cleaned. This also tests the influent gate.

1. **Lift up on the float and hold it up for 30 seconds.**
2. **Release the float.**
   Check that the float hangs freely.
3. **Clear the alarm.**
4. **Reset the alarm at the control panel.**
5. **Verify the alarm with the DCB.**
   Contact the DCB at South Plant, verify the alarm came in and is clear.



Wet Well Bubbler Controls

SECTION 6
Raw Sewage Pumping



6.1 Overview of Raw Sewage Pumping

Sunset Pump Station lifts all the sewage from the Issaquah interceptor to the Heathfield Pump Station wet well, a horizontal distance of about two-thirds of a mile and a vertical lift of about 150 feet. The two 6-inch and two 10-inch raw sewage pumps normally operate automatically, the wet well level normally controls the pumps. The flow from the pump station is normally limited to 15 mgd by the PLC or local LIC. In float control the flow is not limited??? or speed controllers are clamped at 7.5 mgd. Normally one large pump is enough to handle wet weather flows.

Because Heathfield is located so close to residences, it is important that untreated overflows do not occur at this station.When the wet well level at Heathfield reaches 155 inches, the pumps at Sunset automatically slow down. When the wet well level reaches 165 inches, Sunset's pumps are automatically shut off, and an alarm is sent to South Plant Main Control. At South Plant, the DCB operator can make sure the intertie between the stations is working and that the pumps have shut down. If the pumps have not shutdown the DCB operator can shut them down from Forney. An operator must manually restart the pumps at the Sunset Pump Station. Any overflow at Sunset will occur at its 30-inch emergency overflow into Lake Sammamish.

RSPs. There are a pair of large pumps and a pair of small pumps. The pumps normally run in large or small pairs. All pumps equipped with variable speed drives (VFD).

The small 200 hp pumps each have a capacity of 3.7 mgd at 169 feet of total head and produce 1170 rpm. The large 450 hp pumps each have a rated capacity of 11 mgd at 169 feet of total head, and produce 1187 rpm.

Seal/flushing water. The pumps are automatically supplied with seal/flushing water from solenoid valve that opens and closes with the pump. The seal water is supplied from the C2HP or seal water system. For more information about this system see *Section 8, Utilities*.

RSP discharge ball valves. The pumps have discharge ball valves that open and close when the pump starts and stops, these valves perform the function of check valves. The valves are controlled from the pump speed controllers (Moore controllers). The rate of the valve movement is controlled so that damaging water hammer effects are prevented.

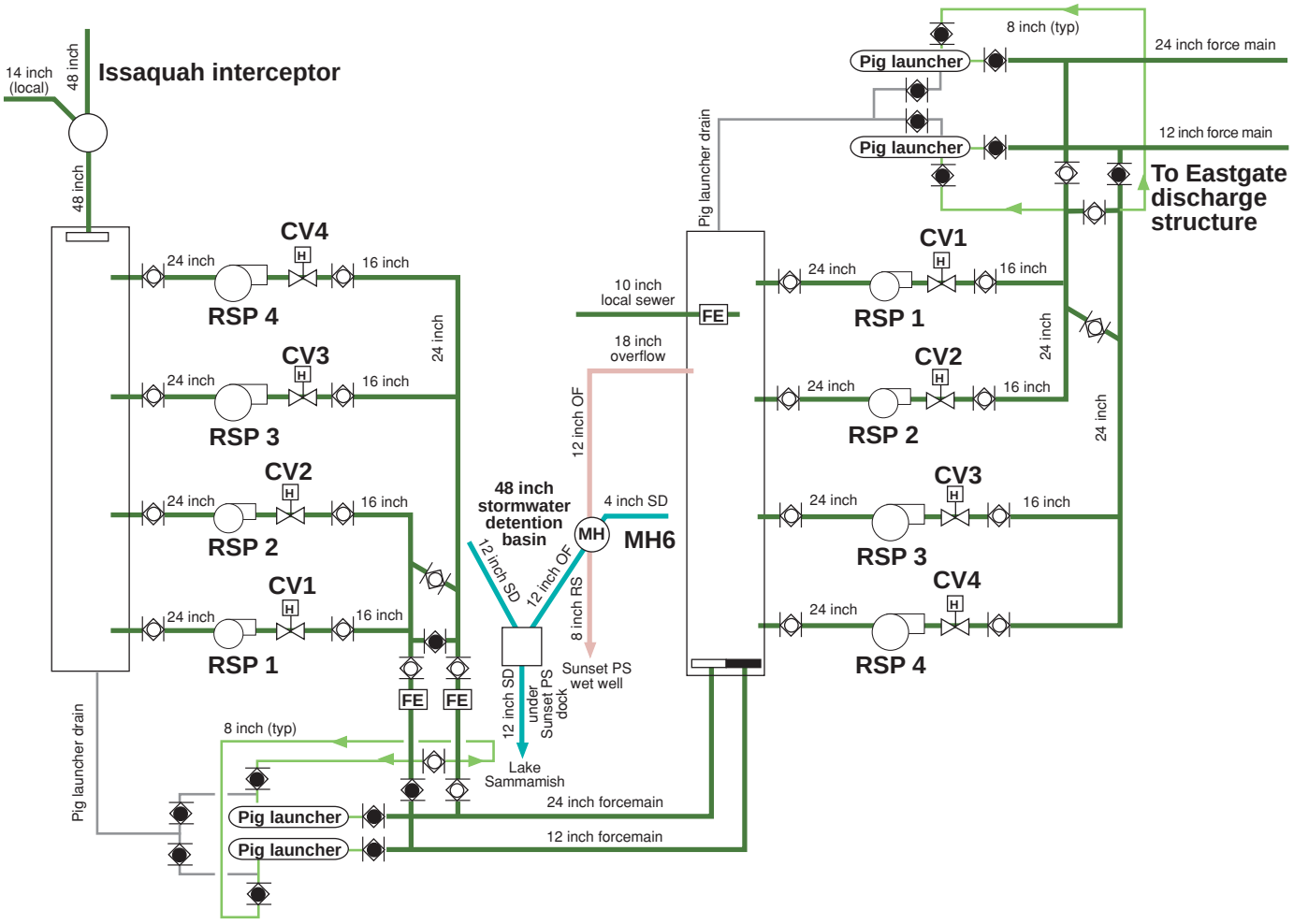
It is normal for the RSP to run backwards until the discharge valve is closed, this is very noisy but does not harm the pump. DO NOT restart a pump while it is running backwards after an emergency ball valve closure or else the pump, shaft, and motor will be destroyed.

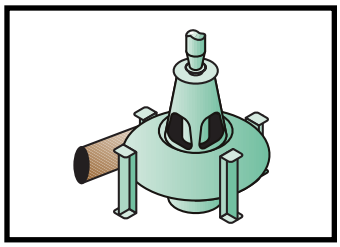
The discharge ball valves are operated by a hydraulic system and controlled by the pump speed controller. During a power outage, the emergency accumulators provide enough power to close any open discharge valves. The rate of the valve movement is still controlled; however, the valves cannot be reopened until electrical power is restored. For more information about the hydraulic system see *Section 9, Auxiliary Systems*.

Heathfield wet well overflow. The Heathfield wet well overflow pipe (invert elev. of 160.25 feet) drains to a local sewer. The wastewater in this line returns to the Sunset Pumping Station through the local sewers. Flows exceeding the carrying capacity of the sanitary sewers back up into the 54-foot long, 48-inch diameter stormwater detention pipe. Once full, the detention pipe overflow to the 48-inch highway storm drain in Southeast 38th Street and into Lake Sammamish.

Pump VFDs. The raw sewage pumps are driven by variable-speed (adjustable frequency) drives. The wet well level not only starts and stops the pumps, it also controls the pump speed. The pump speeds are regulated through the speed controllers on the main control panel (PNL330,205). These speed controllers also control the discharge ball valves.

Influent gate. The influent slide gates are normally open. For more information on the influent gate see *Section 5, Influent Control*. For more information on the gate hydraulic system, see *Section 9, Auxiliary Systems*.





6.2 How the Raw Sewage Pumps Work

Normally, the raw sewage pump (RSP) control strategies operate without operator intervention; however, it is important to understand how the RSPs control systems work so that you can reset and restart the system and verify that the automatic control systems are running as expected. In some ways, the Sunset and Heathfield pump stations function as one extended station with Sunset operating like a lift station for Heathfield. To prevent Sunset's pumps from overwhelming Heathfield, an override is built into the controls, so that a high-high wet well level at Heathfield first slows then stops the pumps at Sunset.

The pumps are normally controlled through one of two automatic control systems, PLC and LOCAL LIC. If the two automatic systems fail, a float controlled system will operate the two large pumps. The pumps can also be operated manually. The REMOTE PLC setting on the control selector switch is for the future, and currently selects the local PLC. Normally pump 1 pumps to the 12-inch force main, pumps 2, 3, and 4 pump to the 24 inch force main.

Control strategy

Automatic RSP level control. PLC is the normal operating mode for the pumps and is selected as PLC on the CMC switch. The PLC automatically monitors pump status, wet well level, and station alarms. and passes the information to the SCADA system at South Plant. A redundant MetroTel system also relays information to South Plant using leased telephone lines.

If the PLC fails the standby level controller will automatically take over. If both fail, the high level float switch (LSH 330.155) will automatically enable float switch control. The station stays in float control until manually changed and reset at the MCP.

Heathfield override of Sunset. In the intertie between the two stations is working and Sunset is in PLC or LOCAL LIC, if the Heathfield wet well level is high, an override control of the Sunset pumps will slow at 155 inches and stop at 165 inches .

Influent gate. The influent slide gates are normally open.

Lead/follow pairs. The pumps run in lead/follow pairs, two small or two large pumps. The small and large pumps never run at the same time AUTO.

The small pump pair starts first, if the level continues to rise, the two small pumps are shut down and the large lead pump is started. As the level continues to rise the large follow pump is started. As the wet well level falls the pump operating sequence is reversed.

PLC and LOCAL LIC set points. The PLC and the STANDBY LEVEL CONTROLLER (Moore controller) operate the same, and run at the same set points.

Set point[a]	Action
90 inches; elev. 152.2 ft.	Small lead pump start at minimum speed Stops at 80-inches; elev. 151.36 ft.
100 inches; elev. 153 ft.	Small follow pump start; both pumps at 100 percent speed. Stops at 90 inches; elev. 152.2 ft.
120 inches; elev.154.7 ft.	Small pumps off; large lead pump on at 100 percent speed. Stops at 80 inches; elev.154.7 ft.
132 inches; elev. 155.7 ft.	Large follow pump start; both pumps at 100 percent speed. Stops at 120 inches; elev. 154.7 ft.

a. elev. are listed in the dwgs and specs as elev. but for true elev 100 feet may need to be added to each set point. inches are for local readout and on Forney and MetroTel.

Float level set points. If the wet well level reaches the high level alarm set point, float control is enabled and only the two large pumps are used. The pumps run in fill-and-draw. Once started the pumps run at full speed. The first time the pumps are started and stopped in float

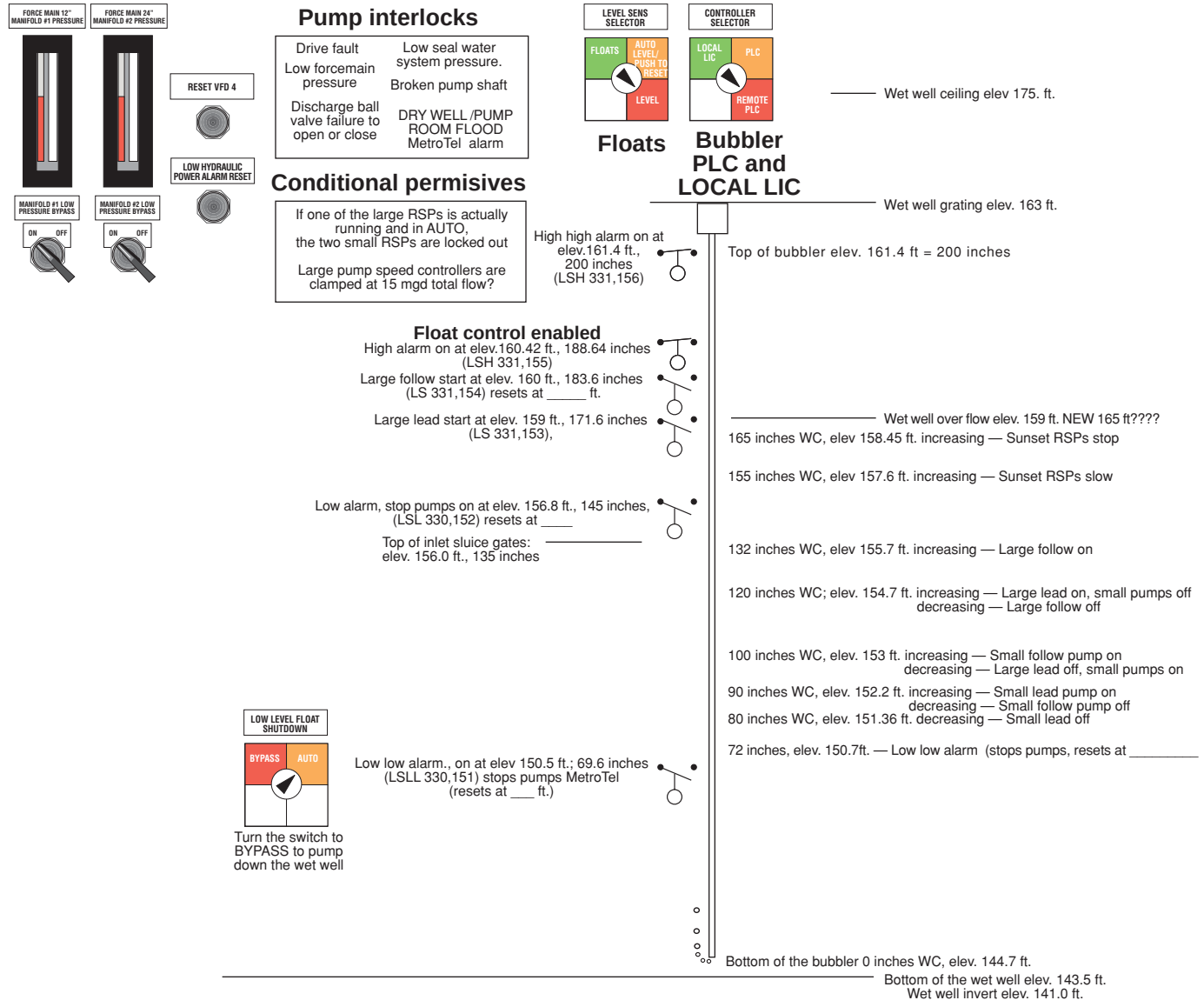
control both large pumps start at once.[1] After that the pumps start in lead and follow, and stop at the same set point.

Set point	Action
188.64 inches; elev. 160.42	Float control enabled LSH 330,155
171.6 inches; elev. 159 ft.	Lead pump start LS 330,153
183.6 inches; elev. 160 ft.	Follow pump start LS 330,154
145 inches; elev. 156.8 ft.	Both pumps stop also low level alarm LS 330,152

1. Wont this exceed 15 mgd discharge capacity? and cause local flooding?

Discharge ball valves. The discharge ball valve is opened once its raw sewage pump is running above minimum speed. The valve is closed if the pump is not running above minimum speed, or if the pump experiences an incomplete stop sequence. In the control logic a "valve close" command will always override a "valve open." The discharge ball valve is controlled by the pump's speed controller.

The valve will be closed by the emergency actuator if the hydraulic pressure drops to 1,050 psi resets at 1,100 psi; MetroTel III at 500 psi. This must be manually reset by pressing the LOW HYDRAULIC POWER ALARM RESET button on the MCP.



Seal water. Seal water is automatically supplied to the RSPs using solenoid valves. The supply valves open and close when the pumps start and stop.

Air bleed-off valve. The large RSPs have an automatic air bleed-off solenoid valve, it is opened for only 10 seconds. You may still need to open and close the manual bleed-off valve after lowering the wet well level.

Variable pump speed. The PLC and STANDBY LEVEL CONTROLLER use proportional speed control. The signal for both is routed to the PUMP SPEED CONTROLLER. Pump speed signal and discharge ball valve control both come through the RSP SPEED CONTROLLERs.

The speed is proportional so that on an increasing wet well level, the speed of the running pumps reaches maximum just before the next pump is started. On a decreasing wet well level, the speed of the running pumps slow to minimum just before the pump is shut down.

The speed of each pump is displayed on the MCP and by pressing the D button on the pump speed controller until V is displayed.

AFD (VFD) power fault automatic reset. A power failure AUTO-RESTART switch is installed on the MCP, PNL330,205. In ON, if the pump adjustable frequency drive (AFD) trips on a power line fault, the PLC monitors line power and when line power has stabilized, it attempts to reset the AFD fault. The PLC will make up to three attempts to reset the fault within a 30-minute period. If three more faults occur in this 30-minute period, there will be no reset. If there are not three faults in the 30-minute period, the timer will reset and repeat the three attempts in another 30-minute period.

Because the PLC normally stops the last pump on a low wet well alarm, you may have to bypass this alarm or run an RSP.

Control options

Lead/follow select. Each pump pair must have a lead/follow position selected. Remember that even numbered equipment and lighting are powered by the Phantom Lake feeder (bus B) and odd numbered equipment are powered the Eastgate feeder (bus A).

Controller selector. The CONTROLLER SELECTOR switch allows you to select between PLC control and LOCAL LIC control (the Moore level controller). REMOTE PLC on the switch selects the local PLC.

Level sensor selector. The LEVEL SENS SELECTOR switch allows you to select LEVEL CONTROL, which will switch between the bubbler and the floats automatically. This is the normal position. When FLOATS is selected, the RSPs will only run in float control.

To reset the switch to AUTO LEVEL CONTROL, select AUTO LEVEL PUSH TO RESET and press the button on the CMC switch.

Remote shutdown. The Sunset pumps can be shut down from Forney at the DCB at South Plant stopping the flow to Heathfield. This is done when the Heathfield/Sunset intertie fails, and the Heathfield wet well reaches high high level. The remote shutdown must be manually reset at the Sunset Pump Station using the large red SOUTH TREATMENT PLANT OVERRIDE RESET button.

Low discharge manifold pressure override switch. The discharge manifold must be open. This is indicated by a minimum pressure of 50 psig. This permissive can be bypassed by placing MANIFOLD #1/#2 LOW PRESSURE BYPASS switch in ON.

Low level float shutdown reset. If you need to pump down the wet well, you can put the LOW LEVEL FLOAT SHUTDOWN switch in BYPASS. When you are finished, place the switch back in NORMAL to enable low level shutdown.

Low hydraulic power alarm reset. This reset button must be used after a low fluid pressure alarm condition has been corrected or the RSPs will not start.

Flow output measurement. Flow meters on the forcemains are totalized on the MCP. The Sunset raw sewage pump output, and the 10-inch sewer flow equals the total sewage flow into the Heathfield Pump Station. The ten-inch sewer flow is indicated and recorded at the MCP[1].

The output from Heathfield Pump Station is normally limited to 15 mgd by the PLC or the LOCAL LIC controllers.

1. There is no place on the new control panel for this.

Wet well level. The wet well level is displayed in feet on the MCP on two 0 to 20 feet level sensors; it is also recorded on the chart recorder.

Chart recorder. The chart recorder indicates both pump station wet well levels, the flow level, and the Lake Sammamish shoreline level.[1]

Pen 1: Sunset level 0-200 feet WC

Pen 2: Lake line level 0-90 feet WC

Pen 3: Heathfield level 0-200 feet WC

Pen 4: flow 0-5 mgd 12-inch forcemain

Pen 5: flow 0-18 mgd 24-inch forcemain

VFD. Each pump VFD has CONTORL POWER ON, DRIVE READY, DRIVE RUN, DRIVE FAULT and MOTOR HI-TEMP lights and a RESET button. There is also a digital display. Use the arrow keys to scroll through the menus. There is also an emergency stop button that you push to disable or stop the pump and pull to reset.

Pump local control panel. TEST/STOP push buttons are located at each raw sewage pump on the bottom level of the pump stations. If there are no faults on the power bus, push and hold TEST to start the pump motor. The STOP button over rides all other control and is used as an emergency stop button.

Influent gate. The influent slide gates is manually opened and closed. They are stored on the wall of the wet well.

Discharge ball valves. The pump discharge ball valves are controlled by the pump speed controller and normally operate automatically. Normally, it takes about 18 seconds to open or close a valve. In an emergency, the valves can be closed in 45 seconds. (30 at Heathfield).

CAUTION

It is normal for the RSP to run backwards until the discharge valve is closed, this is very noisy but does not harm the pump. DO NOT restart a pump while it is running backwards after an emergency ball valve closure or else thepump, shaft, and motor will be destroyed.

1. This is what is on the new dwg CHECK IT OUT.

Wet well bubbler select? A bubbler measures the liquid level in the wet well. Normally, the air for the bubbler is supplied from the instrument air system. There are two bubblers, which bubbler is used is selected at the local bubbler panel on the northeast wall of the wet well.[2] The purge switch is on the local control panel.

Lake line. The lake line level or Sunset's overflow level can be read on the chart recorder, 21 ft is a high level and 28 feet is an overflow.

Restarting the PLC monitoring. Pressing SHUT-DOWN DISPLAY on the alarm history or over-view screen closes the monitoring application. The status screen goes away, and the RUNNING APPLICATION SCREEN appears. Touch the RUN APPLICATION button or the F2 key to relaunch the monitoring software.

Alarms

Resetting alarms. Station alarms register on the annunciator panel on the MCP. Panel alarms must be acknowledged and cleared at the MCP as well as at the PLC alarm screen.

- RAW SEWAGE PUMP NO 1, 2, 3, 4 FAILURE. VFD fault, high motor winding temperature, broken pump shaft.
- WET WELL HIGH HIGH (LSHH 331,156) (WET WELL HI/LO MetroTel) The wet well has reached 200 inches; elev 161.4 ft. Sunset's pumps should have stopped at 165 inches and stopped the influent. All pump controls have failed, all the pumps have failed, and/or there is local flooding into the wet well.
- WET WELL LEVEL HIGH (LSHH 331,155) The wet well is at 183.6 inches; elev.160 ft., this has enabled float control of the RSPs. Only the two large pumps will run.
- WET WELL LEVEL LOW (LSL331,152) The low bubbler set point has tripped at 72 inches; elev. 150.7 ft. The pumps are stopped.
- WET WELL LEVEL LOW LOW (LSLL 331,151) (WET WELL LEVEL HI/LO MetroTel) The wet well is 69.6 inches; elev. 150.5 ft.The low low level has been reached the pumps did not stop at low level. There is another stop signal at this point.

2. It is unclear if both bubblers will be replaces with 0-20" bubblers or if only one is being replaced and the 0-7' bubbler (a) remains.

- DRY WELL (MetroTel PUMP ROOM FLOODED or DRY WELL FLOOD) Float switch near_____ has floated. Shuts down all the RSPs.
- SEAL WATER PRESSURE LOW (PSL 331,013) C2HP pressure is less than 70 psi decr., shuts down the RSPs or prevent them from starting. RSP 3 will run in fill-and-draw. Seal water pumps have failed or there is a broken pipe.
- BALL VALVE FLUID POWER PRESSURE LOW (PSL 331,101) (BALL VALVE HYD PRES LOW MetroTel) The hydraulic system does not have enough pressure (1,050 psi resets at 1,100 psi; MetroTel III at 500 psi) to open/close the RSP discharge valves. The RSPs are stopped, the emergency accumulators close the valves. Must be manually reset at the MCP before the RSPs will restart.
- 24 VDC SYSTEM NO.1, 2, 3, 4 CONTROL POWER FAIL One or both of the 24V DC power supplies located in the main control panel has failed.
- PROGRAMMABLE CONTROLLER TROUBLE (PLC FAILED MetroTel) The PLC (programmable logic controller) has failed.The raw sewage pumps will automatically switch to backup level control.
- LOCAL CONTROL MODE The RSPs are running in LOCAL LIC, either because of PLC failure or LOCAL LIC has be selected at the CONTROLLER SELECTOR switch.
- PLC TELEMETRY FAILURE The MetroTel or SCADA (Forney) system has failed or intertie has failed, DCB operator should monitor wet well levels and shut down Sunset pumps if necessary.
- FLOAT SWITCH TROUBLE (MetroTel only) The float control system has failed. The wet well is at 200 inches; elev. 161.42 ft. The ceiling of the wet well is elev. 175 ft.; the grating is elev. 163 ft.; the overflow is at elev.159 ft.
- LEVEL SENSOR TROUBLE (LEVEL SWITCH TROUBLE FLOAT MODE MetroTel) The RSPs are running in float control, the PLC and LOCAL LIC have failed and the wet well has hit 188.64 inches; elev. 160.42 or someone has selected FLOATS on the LEVEL SENS SELECTOR switch on the MCP.
- LEVEL CONTROLLER FAIL (STANDBY LIC FAILURE MetroTel)The PLC and LOCAL LIC controllers have failed or LOCAL LIC control was selected and has failed and the RSPs are now running on float control. Float control is enabled at 188.64 inches; elev. 160.42.
- LOW LEVEL SHUT DOWN BYPASSED The LOW LEVEL FLOAT SHUTDOWN switch has been turned to BYPASS.
- AC CONTROL POWER FAILURE (LOSS OF CONTROL POWER MetroTel) The power transformer that supplies CPP 310,206 has failed or the Phantom Lake feeder has failed and the generator did not start. There is no control power. Contol power panel on UPS. After 20 minutes, there will be no alarms and the RSP 24 V power supplies will not work.
- FLOAT MODE (MetroTel only) The PLC and LOCAL LIC controllers have failed or someone has selected FLOATS on the LEVEL SENS SELECTOR on the MCP.

Interlocks

Dry well alarm. The PUMP ROOM FLOOD (MetroTel) or DRY WELL alarm on the LAP Float switch near_____ has floated. Shuts down all the RSPs.

Discharge ball valve operation. The ball valves are controlled by the pump speed controller (Moore controller). Once the pump reaches minimum speed the valve should open. If it takes longer than 90 seconds, the RSP is shut down. If the ball valve does not shut within 90 seconds of the pump stopping, the pump will not restart.

Broken pump shaft. If the pump speed of a running pump drops below minimum for 60 seconds, the pump will shut down. If the pump speed does not reach minimum within 60 seconds of shutdown, the pump will not restart. Both these conditions could indicate a broken pump shaft.

Heathfield wet well high. The Sunset pumps will first be slowed to minimum speed and the stopped. They cannot be restarted as long as the Heathfield wet well remains high.

South Plant shutdown. South Plant can shut down the Sunset pumps if the Sunset/Heathfield intertie fails. At South Plant, select the SHUT DOWN button and pressing the right mouse key and reset by selecting NORMAL and pressing the

right mouse key. The shutdown is reset at Sunset Pump Station by pressing the SOUTH TREATMENT PLANT reset button on the MCP.

One Sunset pump is running??. DON"T see this in the NEW STRATEGY, but after a low shutdown, one Sunset pump must be running before the Heathfield pumps will start.

Low force main pressure. As long as the force main pressure is below 50 psi, prevents RSPs from starting, or will shut down the RSPs. This condition could indicate a break in the pipe or a closed valve. This can be overridden by turning the forcemian manifold low pressure bypass ON/OFF switch to ON.

Low seal water system pressure. When the seal water system pressure is below 70 psi decr. the RSPs will shut down; if they are stopped, they will not start.

Large pump in AUTO. If one of the large RSPs is actually running and in AUTO, the small RSPs are locked out. Put the large pump in MANUAL to start a small pump.

Drive fault. The pump VFD has a fault. This must be corrected and the fault manually reset by pressing the RESET VFD button for the pump.

Lockout

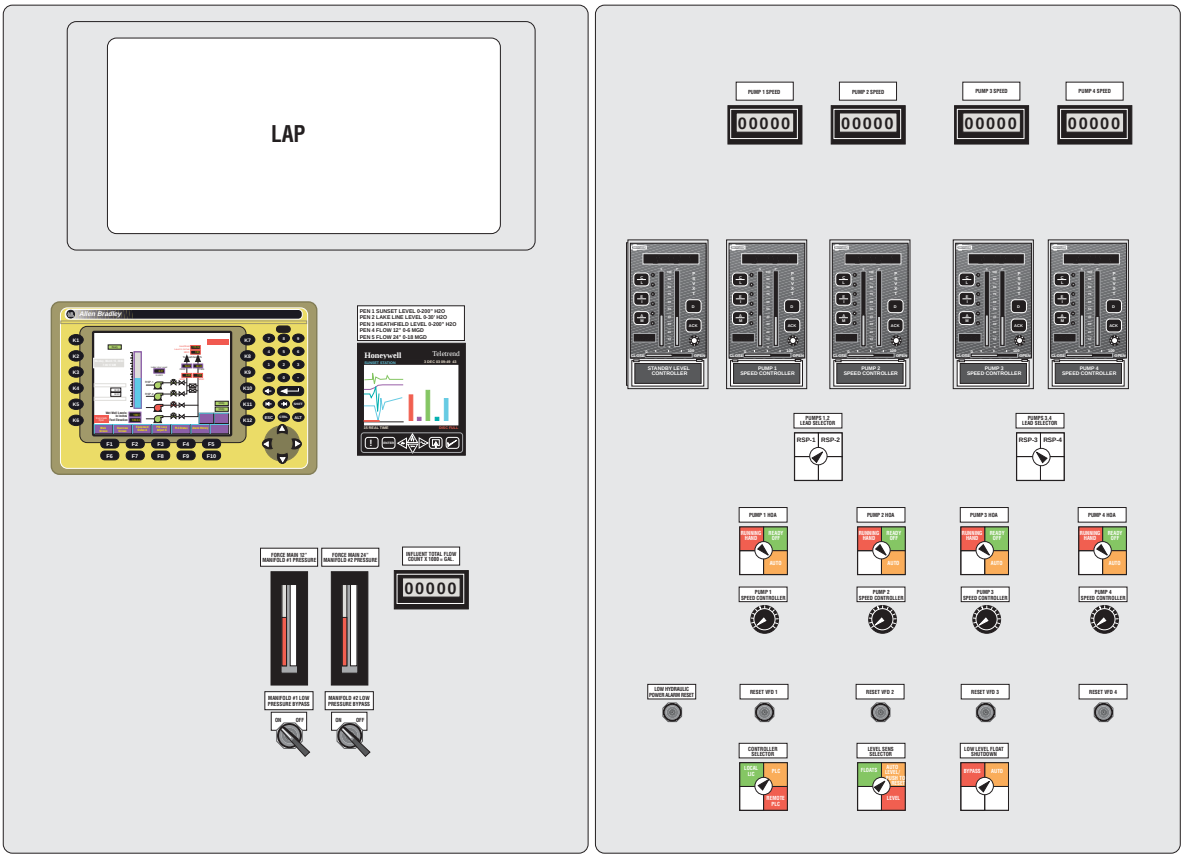
Lock out 120 V power to the PLC at the UPS breaker box.

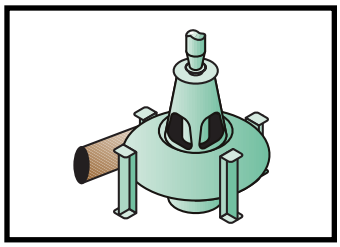
Lock out 120 V power to the operator interface by removing the FU8 fuse in the PLC cabinet.

Lock out 120 V power to the telemetry unit by unplugging the power cord from the electrical outlet.

Power outage

The standby generator can power half the station. There are two feeders for the station known as the Phantom Lake feeder and the Eastgate-13 feeder. Each feeder supplies half the station equipment. RSPs 1 and 3 are powered by the Phantom Lake feeder, RSPs 2 and 4 by the Eastgate-13 feeder. The auxiliary equipment also has the odd numbered equipment powered by Phantom Lake and the even numbered equipment powered by the Eastgate feeder.





6.3 Operating a Raw Sewage Pump

Operating the raw sewage pumps (RSPs) correctly is the key to avoiding overflows. Many safeguards are built into the system and these permissives must be met before the pumps will run. It is equally important that the pumps will start and run when needed. Generally, RSP 1 is designated the small lead pump. RSP 1 pumps into the 12-inch force main. Normally, one small pump is enough for dry weather flow conditions. If the flow increases, RSP 2 begins pumping into the 24-inch force main. If needed, the two large pumps will start in lead and follow and the small pumps will stop. Normally, one large pump is enough to handle average wet weather flow. Flows are restricted to 15 mgd leaving Heathfield Pump Station by the PLC and the LOCAL LIC.

Getting the pumps ready

There are several interlocks on the RSPs, each permissive must be satisfied or one or more of the RSPs will not work, for more information on these permissives, see the previous module.

CAUTION

Due to Eastgate Trunk flow restriction of 15 mgd, do not run RSPs 3 and 4 together at any time.

1. **Check that the pumps have power.**
   Verify power is available to the pump motor, the control circuits are normal, and there are no internal or external fault conditions which have not been reset. Pumps should indicate READY.

2. **Clear any alarms.**
   See the section on *Alarms and "Interlocks" on page 6-8* to see which alarms and interlocks would affect the RSPs.

3. **Check that the lead/follow selection has been made.**
   Generally, RSP 1 is designated the small lead pump. RSP 1 pumps into the 12-inch force main. One small pump is normally enough for dry weather flow conditions. If the flow increases, RSP 2 begins pumping into the 24-inch force main. One large pump is usually enough to handle average wet flow conditions.

4. **Check the pump HAND/OFF/AUTO (HOA) switches at the MCP are set to AUTO and AUTO-RESTART switch is ON.**

5. **Check the wet well level.**
   The wet well set points must be reached for the size and lead/follow assignment of the pumps, or they will not start.

NOTE: If a large pump is in AUTO, a small pump will not start because the large and small pumps cannot run at the same time. Turn the large pumps to OFF to start a small pump. Be sure and return all the pump HOA switches to AUTO to enable automatic control.

6. **Check that one pump is running at the Sunset Pump Station.** [1]

7. **Check that there are no incomplete startup sequences.**
   Check that the emergency accumulators for the ball valves are fully charged and closed. Because the pump speed controllers control the discharge ball valves, the pump speed controller must also be working. Lock out and turn the HOA switch to OFF if the speed controller is not working.

8. **Check there is at least 50 psig in the main discharge manifold.**
   This indicates the manifold is open to the Eastgate discharge structure. Check the situation out before overriding this low pressure interlock at the MCP.

9. **Check that seal water system pressure is at least 70 psi.**

Starting a pump manually

If you want to run a small RSP manually and a large RSP is running in AUTO, you must put the

1. Still true?

large RSP in manual before you can start the small pump.

1. **Follow the steps in "Getting the pumps ready."**
2. **Verify that FLOAT is not selected on the LEVEL SENS SELECTOR.**
3. **Turn the HOA switch to HAND.**
   The pump should start.
4. **Use the pump speed pot to control the speed.**
   You can also put the pump speed Moore controller in M (manual) and use the output adjuster knob on the controller. Put the controller in A (auto) when you are finished to return control to the PLC or STANDBY CONTOLLER.[1]

Running the pump in float control

1. **Follow the steps in "Getting the pumps ready."**
2. **Turn the LEVEL SENS SELECTOR from AUTO LEVEL to FLOAT.**
3. **Lift the high wet well float (FS 331,156) to enable float control.**
   Both large pumps should start unless the wet well is 171.6 inches; elev. 159 ft., then lift FS 330,154 to test the pumps.

NOTE: The pumps must turn on and off once before you can test the lead and follow float switches.

4. **Reset the system to normal.**
   When you are finished running in float control, reset the system to normal level control. Turn the LEVEL SENS SELCTOR switch to AUTO and press the button in the center of the knob.

Operating the pumps in LIC

1. **Follow the steps in "Getting the pumps ready."**
2. **Verify that the LEVEL SENS SELECTOR is in AUTO or LEVEL**
3. **Turn the CONTROLLER SELECTOR switch to LOCAL LIC.**
   The pumps should run from the normal set points receiving start, stop and speed signals from the STANDBY LEVEL CONTROLLER (Moore controller).

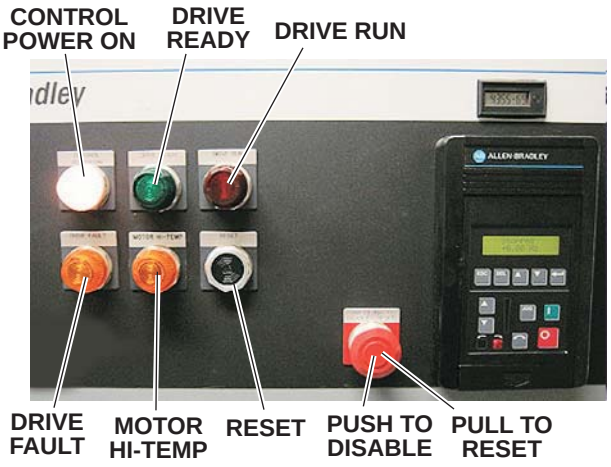
Operating the pumps in PLC

1. **Follow the steps in "Getting the pumps ready."**
2. **Verify that the LEVEL SENS SELECTOR is in AUTO or LEVEL.**
3. **Turn the CONTROLLER SELECTOR switch to PLC or REMOTE PLC.**
   The pumps should run from the normal set points receiving start, stop and speed signals from the station PLC. There is no remote PLC at this time.

Resetting a VFD fault

If a fault does not clear automatically, a brief statement should appear on the VFD LCD display. This fault will continue to display until the RESET VFD button is pressed on the MCP, or the drive power is turned off and then back on, or the RESET button on the drive is pressed. There is also an emergency stop button that you push to disable or stop the pump and pull to reset.[2]

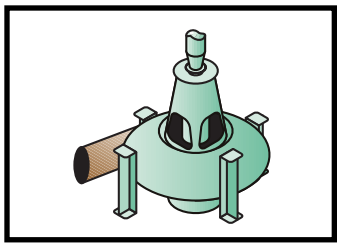
If the fault condition has cleared either method will reset the fault. The alarm must also be acknowledged at the LAP using the ACK button.



VFD controls

1. CHECK THIS OUT since the speed controllers open and close the discharge valves can the POT be used or should we be using the speed controllers in MANUAL and OUTPUT.

2. This seems like a lot of ways to reset a fault



6.4 Troubleshooting the RSPs

If the pumps do not meet permissives or level set points they will not startup. The Heathfield raw sewage pump (RSP) control strategy can also hold out the pumps. If the intertie between Heathfield and Sunset has failed, the DCB operator at South Plant may have also shut down the pumps. To prevent overflows at Heathfield it is always important to consider both stations before restarting the Sunset pumps. The Issaquah interceptor has about 0.75 mgd or about 24 hours of dry weather storage which should give you time to carefully access the situation before restarting the Sunset RSPs.

Troubleshooting a startup

Whenever a raw sewage pump is operated through the PLC in AUTO or HAND the pump will not run if:

- The pump is locked out.
- The pump motor READY light is off indicating a VFD fault.
- There is a wet well low-low level alarm.
- South Plant has shut down the pumps and the reset button has not been pressed.
- The seal water system pressure is low
- The ball discharge valve system pressure is low or the emergency accumulator pressure is low
- There is low pressure in the main discharge manifold (that is, the pump discharge line must be open to the Eastgate trunk sewer). (There is a manual bypass for this permissive[1])
- There is an incomplete pump start or stop sequence, either a discharge ball valve failure, or a broken pump shaft.
- The dry well float near _____ is active.

NOTE: A small pump will not start if a large pump is running in AUTO. If the influent gate is closed only the small lead will run.

- The large pumps automatic air bleed valve only opens for 10 seconds on startup. If the large pumps have not been run in a long time, the pumps may become air bound and shut down as the wet well lowers.

Sunset low wet well level

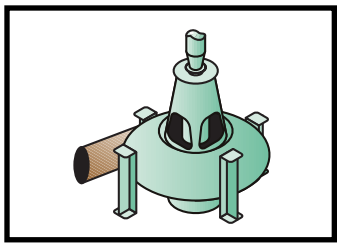
A wet well low low alarm is sent to the Metrotel computer and SCADA at South Plant, and the Sunset pumps are shut down. A low low alarm is unusual because the pumps are normally stopped before a wet well low low can occur. It may indicate a problem with Sunset or Heathfield's pump control. IS THE ONE SUNSET PUMP CONDITION STILL IN EFFECT?

Make sure all pumps at Heathfield are running properly before restarting Sunset. Verify weather the pumps where shut off because of the intertie alarm or because someone at South Plant shut the pumps down.

Overflow at Heathfield

It is important that Heathfield not overflow because it is surround by houses and overflows enter Lake Sammamish. Although it is unlikely, a partial blockage of the Heathfield pump suction or discharge lines, a control loop malfunction, or mechanical problems could overwhelm the Heathfield pumps. If the intertie that communicates the slow and stop signal to the Sunset RSPs fails, the Sunset pumps can be stopped from South Plant on Forney, stopping the flow to Heathfield. On the Sunset screen select the STOP SUNSET PUMPS target, select SHUTDOWN and press the right mouse key to execute.

1. I DONT SEE THIS ON THE NEW MCP



6.5 Pumping Down the Wet Well

All pump stations are normally pumped down on Mondays and Thursdays. Normally two operators are needed to perform the pump-down. One operator runs the pumps, and the other hoses the wet well. Two pumps are placed in manual and used to maintain a wet well level close to 0 feet. Clear all operating alarms before starting the pump down procedure.

All pumps are run in HAND. Pumps left in AUTO drop off when the wet well goes below set point. Pumps 1 and 2 are used to control the incoming flow. These small pumps will not start to run in AUTO until the large pumps drop off as long as the large pumps are in AUTO.

To prevent Sunset from overflowing into Lake Sammamish the influent gates are left open to pump down the wet well. In dry weather the gates may be closed as long as the lake line is monitored, 21 feet is a high level, the line overflows at 28 feet. There is about 0.75 mgd of storage in the Sammamish interceptor.

Pumping down the wet well

CAUTION

The minimum wet well level is 0.0. Pumping down the wet well below 0.0 may result in pump cavitation or damage.

1. **Turn off the low level shutdown.**
   Turn the LOW LEVEL FLOAT SHUTDOWN switch to BYPASS or all the pumps will be shut down at the low low level set point.

2. **(Operator 1) Start the two small pumps and balance the flow with pump 2.**
   Check the 1 force main flow meter, note the current level (2.5 to 3.5 mgd). You will need this to balance with pump 2. The output of pumps 2, 3, and 4 is measured at 1 force main.

   a) Start pump 1 in HAND. Turn the HAND/OFF/AUTO (HOA) switch from AUTO to OFF, pause for 4 seconds, then turn to HAND.

   b) Turn the pump 1 pot (speed controller) to about 8. When the ball valve light comes on (it will stay on from 10 to15 seconds as the valve opens), turn the pot to 10. Turn the speed pot counter-clockwise to speed the pump up or clockwise to slow it down.

   c) Start pump 2 in HAND. Turn the HOA switch from AUTO to OFF, pause for 4 seconds, then turn to HAND.

   d) Turn the pump 2 pot to about 8. When the ball valve light comes on (it will stay on from 10 to15 seconds as the valve opens), turn the pot so you match the previous flow reading on 1 force main flow meter.

3. **Pump down the wet well level with pump 3.**

   a) Turn pump 3 HOA switch to OFF, pause 4 seconds, then turn the switch to HAND. Pump down wet well level with pump 3 by raising the pump speed, using the speed pot.

   b) Start pump 3 in HAND. Turn the HOA switch from AUTO to OFF, pause for 4 seconds, then turn to HAND.

   c) Turn the pot to about 8. When the ball valve light comes on (it will stay on from 10 to15 seconds as the valve opens), turn the speed up until the flow matches the previous reading on 1 force main flow meter.

   d) When the level reaches 20 inches, turn the pump to OFF.

4. **Pump wet well down to 0.0.**
   Use small adjustments to raise or lower the speed of pumps 1 and 2 and maintain 0.0 inches in wet well.

NOTE: Once you reach 20 inches, use small increments when you manually adjust the pump speed. This will avoid wet well

surges that can cause the pumps to become airbound.

DANGER

Before entering the wet well, verify that the wet well fans have been working for at least 3 hours (for proper air exchange). Verify there is no WET WELL AIR ANALYSIS alarm, and the wet well light switch has been turned on for at least 30 minutes. Use the sample pump on the work bench with your meter to sample the air quality.

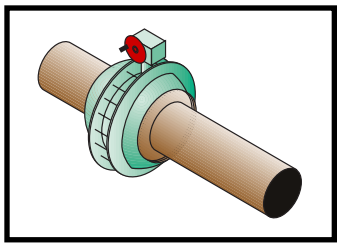
Before removing any hose, nozzle, or coupling ,be sure all the pressure has been relieved. Use safety clips on all connections.

5. **(Operator 2) Hose down the wet well.**
   a) Turn on the C2 and push the C2 washdown pump START button.
   b) Go down in the wet well and hose the sides, gates, and guides of well. When done hosing, push the C2 washdown pump STOP button and turn off C2 water.
6. **Purge the wet well bubbler**
   a) Turn the purge switch down to the intent position (half way) for 3 seconds.
   b) Turn to the down position (full open). Purge for 15 seconds.
   c) Return to the intent position for 3 seconds, then back to the fully closed position (straight up).
   d) If the bubbler is left in purge it is disabled.
7. **Put pump 3 at zero output**
   Turn the speed adjustment knob of RSP 3 clockwise to zero.
8. **Put RSPs 1,2 and 3 in AUTO power failure restart.**
   Turn the HAND/OFF/AUTO switch from HAND to OFF, pause for 4 seconds, then turn to AUTO.
9. **Bleed the air off RSPs**
   Go down to the pump room and open the bleed off valves. When the lead pump comes on, close the bleed off valves.
10. **Return the LOW LEVEL FLOAT SHUTDOWN switch to AUTO.**
    If you do not return this switch to AUTO, the low low level shutoff is bypassed and the pumps can pump dry and be damaged.
11. **Reset any alarms.**
    Clear and reset any alarms on alarm panel.
12. **Test each pump is operating normally.**
    Turn off each RSPs and put it in HAND, be sure the pump starts and is operating normally.
13. **Check lead/follow pumping sequence**
    Check to the lead/follow sequence is back to normal, and that all RSPs are in AUTO. Check that the lead pump comes on as expected.
14. **Check that alarms are clear at South Plant.**
    Call South Plant Main Control and verify that all alarms are in and clear.

NOTE: At Heathfield, leave the LOW LEVEL FLOAT SHUTDOWN in BYPASS until the wet well level is normal. If Heathfield's wet well level is too low, Sunset will not run in automatic.[1]

1. Is this still true? I don't see it in the new control strategy however the system was supposed to duplicate the functionality of the current PLC program.

SECTION 7
Force Mains



7.1 An Overview of Force Main System

The Sunset Pump Station lifts all sewage collected by the Issaquah interceptor and several local sewers from the South Lake Sammamish-Issaquah area to the Heathfield Pump Station. The Heathfield Pump Station pumps this wastewater nearly one-third of a mile and 160-feet up through two parallel force mains to the Eastgate Trunk Sewer. By understanding the effluent flow from Sunset and Heathfield Pump Stations, you can avoid overloading a downstream system unnecessarily. The Issaquah interceptor has storage capacity of about 0.75 mgd or about 24 hours of dry weather storage.

Heathfield force mains

The two force mains leave the station under the pig launchers, and cut over to SE 35th Place, and follow it up the hill to Eastgate Way. The force mains enter the Eastgate trunk sewer on opposite sides of Eastgate Way, near its intersection with SE 35th Place. The 24-inch forcemain crosses Eastgate Way and empties into the Eastgate discharge structure. The 12-inch forcemain turns the corner and stays on the north side of Eastgate way and enters the Eastgate trunk sewer at a manhole about 10 feet inside the planting along the sidewalk. There is an air release valve on the 12-inch forcemains; it is in a manhole in a planting area on the north side of SE 35th Place about 50 yards from the stop sign at Eastgate Way.

Control strategy

The force mains are manually configured. Normally, RSP 1 pumps to the 12-inch force main and RSP 2, 3, and 4 pump to the 24-inch force main. If the force main valves are not open to to the Eastgate trunk sewer, indicated by at least 50 psi of pressure, the raw sewage pumps will not start. (The pressure is maintained by the hill.)

Control options

Valving. RSP 1 normally pumps to the 12 inch force main; RSPs 2, 3, and 4 normally pump to the 24-inch force main. The force mains have cross connect valves between them.

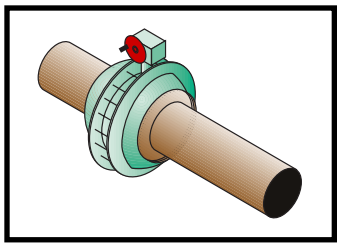
Pigging. There is one 12-inch and one 24-inch force main pigging station. The 12-inch force main has a 24-inch section at the beginning and at the end, which makes pigging it very difficult. The pig would have to be retrieved at the manhole before it enters the Eastgate trunk sewer. Normally, only the 24-inch force main is pigged.[1]

Flow meters. Each force main has its own flow meter. The meters and local readouts are in the flow meter room off the control room.

Alarms

If the discharge force main pressure is not at least 50 psig, an alarm registers[2] and the RSPs shut down. The force main pressure can be monitored from the MCP. There is an ON/OFF override switch for this permissive located on the MCP. It is labeled MANIFOLD LOW PRESSURE BYPASS .

1. HAVE we ever pigged the forcemain, how do we retrieve the pig from the Eastgate discharge structure????
2. I DONT SEE AN ALARM FOR THIS I think either this is only a RSP permissive or that this is gone.



7.2 Pigging the Force Main

Deposits can build up inside the force mains. This reduces the effective diameter of the pipes, restricting flows and increasing pumping heads, which increases energy use. One method of cleaning the pipes is pigging. This method forces a snug-fitting cleaning device, called a pig, through the lines. Pigs come in a variety of designs for different applications. However, all pigs work either by compressing the adhering deposits or by scraping them off. The discharge from the operating raw sewage pumps is redirected through special purpose piping to propel the pigs through the force mains. Pigging is often contracted out.

General consideration for pigging

There are several factors to consider when pigging the force mains. First, the perfect pig design does not exist; different designs address different problems. Lines must usually be pigged more than once during a cleaning cycle to remove the accumulated deposits adequately. Before launching the pig, push it as far forward as possible against the reducer. Eliminate as much liquid from bypassing the pig so the force of the pump out squeezes the pig into the force main. The knife gate valve downstream of the pig launcher must be fully open before an attempting a launch.

Pigging speeds 3 to 9 feet per second (2 to 6 m.p.h.) are generally successful. Slower speeds are less successful in removing line deposits, and higher speeds increase the probability of pipe or equipment damage. Certain types of pigs and line conditions may make speeds outside this range desirable. It is impossible to maintain a constant pigging speed. Actual pigging speed depends on the thickness of the line deposits, the friction between the pig and the pipe, the pressure driving the pig, the back pressure in the line ahead of the pig, the uniformity of the pipe, and the slope of the line, among other factors.

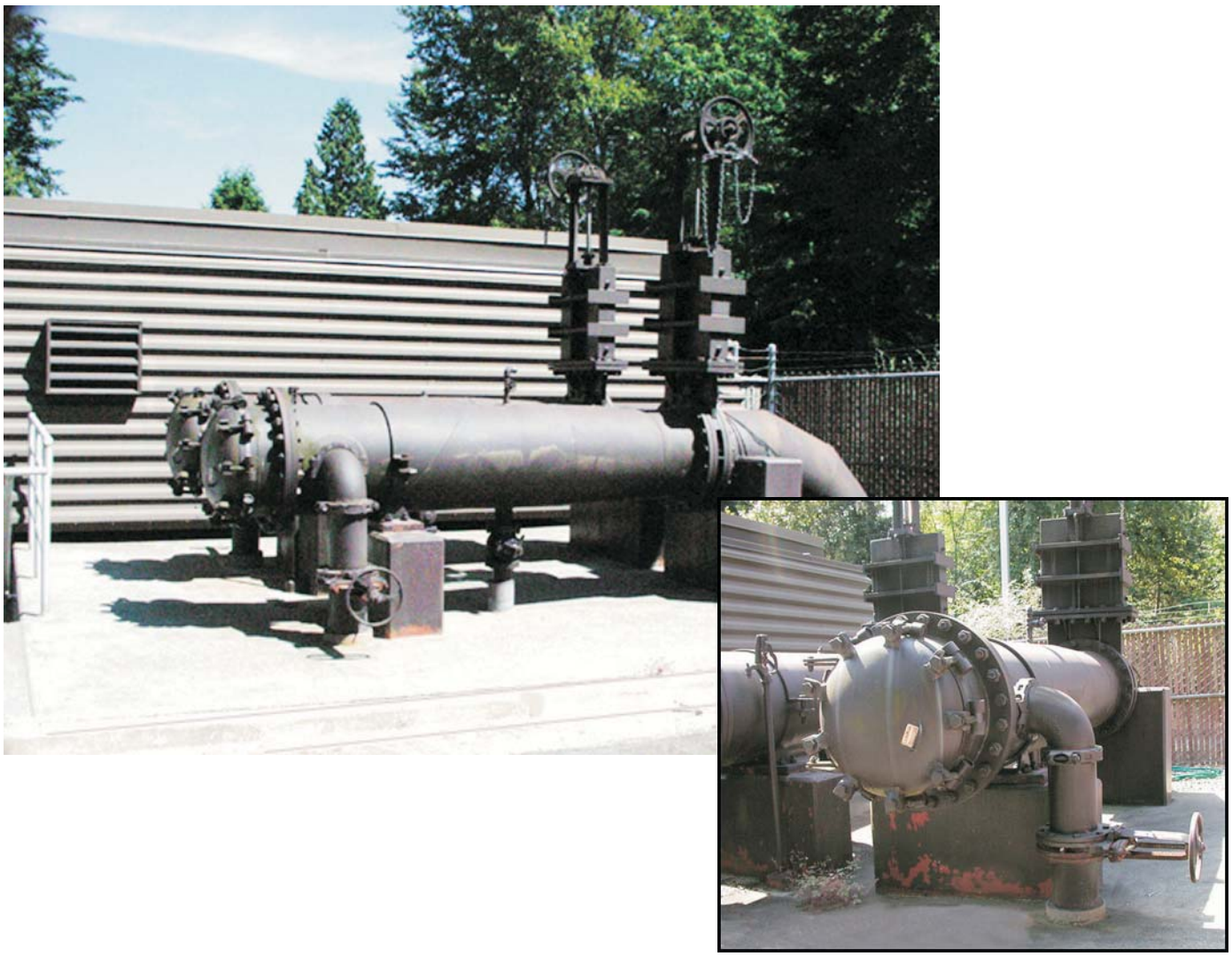
Pig launchers

The pig launching stations are located outside the pumping station building: atop the west corner of the roof. Each force main has its own pig launcher. The launchers have a larger diameter than their associated force mains, to be able to insert the pig. The pigs are loaded through hinged steel caps in the end of the launchers.

The discharge from any raw sewage pump(s) can be re-directed to the rear of either of pig launchers. The pressurized sewage stream then propels the pig through the pipe. The pig must be retrieved at the end of the force main. The retrieval technique depends somewhat on the location and the type of pig. A foam pig that would float could be easily netted from the Heathfield Pumping Station wet well. A heavy cup or disk pig would be much more difficult to recover, particularly since the force mains enter this wet well vertically through the floor.[1]

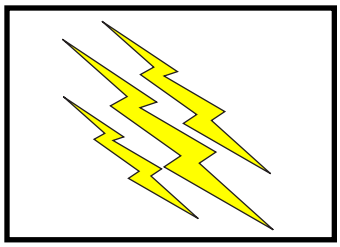
The 24-inch force main could be easily pigged. Pigging the 12-inch force main is not recommended because it has 24-inch lengths of pipe at its entrance and exit, much of the force main is underground and it has multiple elbows. The pig might lodge in one of these larger diameter line segments, and removal could be very difficult and expensive.

1. What kind of pig would be able to be retrieved at Eastgate??????



Pig Launchers

SECTION 8
Electricity and Water



8.1 An Overview of the Electrical Power System

Nothing in the pump station can run without electricity, even the hydraulic systems have electric pumps to maintain their pressure. The emergency accumulators will only close the discharge valves and influent gate in case of a complete power failure.

The electrical system has two feeders (independent sources of electricity). Each feeder normally carries half of the station's load. The Eastgate feeder (bus A), from the Eastgate substation, powers the odd numbered equipment. The Phantom Lake feeder bus B), from the Phantom Lake substation, powers the even numbered equipment and lighting. A diesel powered standby generator can power half the equipment at the station — either bus. The control power can be supplied by either bus or an uninterruptable power supply (UPS) in case of a total power failure.

Electrical distribution system

Puget Sound Energy (PSE) provides power to Heatfield Pump Station. The electrical distribution system provides primary power for all of the equipment and to the transformers that supply the station's control power.

12.5 kV feeders. Each 12.5 kV feeder passes through a PSE-owned disconnect switch and transformer before entering the pump station. The service transformer reduces the incoming voltage from 12.5 kV to 480 volts. Both the disconnect switch and the transformer are only operated and serviced by PSE personnel. Each feeder has a separate meter. The transformers are in the yard next to the pig launchers.

Service panel. The incoming power enters the station on the top floor. The main breakers, the tie-breaker, and the distribution circuit breakers for both buses are in the control room. The main breakers and tie breakers trip automatically in the event of overload, short circuit, or ground fault.

A Kirk key interlock is provided for the tie-breaker and main breakers. The Kirk key system consists of three locks, one for each main and tie-breaker, but only two keys; this arrangement allows only two of the three breakers to be closed at any one time. If a breaker is locked, it cannot be closed. The key must be inserted and turned before the breaker can be closed. The key cannot be removed from an open breaker.

Each bus service panel also has an automatic transfer switch. It is rated for 480V 3 phase, 4 wire, 60HZ and 1200 amps .

Distribution breakers. Distribution circuit breakers are installed at each raw sewage pump switchboard and in the 480 V motor control centers (MCC). They have toggle handles, which indicate the tripped status. The handles cannot be used to hold a breaker closed against short circuit. There is a metal cover over the breakers.

Emergency lighting. There are two battery powered emergency interior lighting systems. Each has a light switch that controls a battery power supply and several remote wall-mounted lights. The battery is a long-life, 12 volt lead battery, with a solid state charger, a transfer circuit, a test switch and charge rate pilot light, voltmeter, ammeter, a load disconnect switch, a brown-out circuit, and an utility power (AC) ON pilot light.

Control power. Power to the control power panel is supplied by the control power transformer and can be supplied from either MCC. There is no preferred power source; the current power feed is set on the control power ATS[1]. The control power panel is located between the ATS switch panel and the UPS . The main control panel faces the motor room. The control power panel is located just north of the main control panel. There is power for two programmable controllers, currently only one is installed.

UPS. The UPS supplies power to the control power panel for 20 minutes in case of a power to allow alarms to be sent to South Plant. Because of the automatic load switching, to lose the control panel power would require both MCCs to fail, the

1. DO NOT SEE this selection

automatic transfer switch to fail, or the control power transformers to fail. None of these conditions are very likely.

The main purpose of the UPS is to provide conditioned power to the control panel to prevent damage to the instrumentation. The UPS converts the 120V AC input to direct current using a rectifier, then converts the power back to conditioned AC power with an inverter. This conditioned power is carefully controlled to provide constant voltage and constant frequency.

UPS and Batteries

The system has a battery, a battery charger, a rectifier, an inverter, and a bypass line transfer switch. All of this equipment is in the control room on the north wall. Sealed lead-calcium gelled batteries provide the backup power.

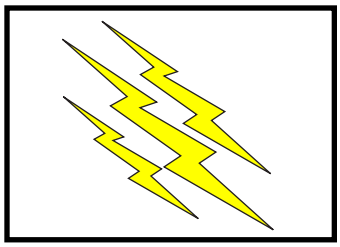
Standby generator. The standby generator is a 1250 kW diesel powered generator with a 600 gallon fuel tank. It is in a stand alone building at the back of the station in the yard across from the pig launchers. The fill station is outside the yard at the end of the driveway, and is normally kept locked.

Standby Generator

Distribution

MCC A (MCC 331,203) Eastgate feeder	
Sump pump 1	P 330,005
Seal water pump 1	P 330,011
Control power transformer 1	TFR 330,206
Space	
Washdown water pump	P 330,014
Return air fan	F 330,122
Ball valve fluid power pump 1	P 330,101
Instrument air compressor 1	C 330,111
Carbon filter fan	F 330,425

MCC B (MCC 331,204) Phantom Lake	
Sump pump 2	P 330,006
Seal water pump 2	P 330,012
Wetwell transfer fan	F 330,423
Control power transformer 2 30A utility receptacles	TFR 330,206
Standby generator 480 V Aux pwr	
Instrument air compressor 2	C 330,112
Spare	
Ball valve fluid power pump 2	P 330,102
Lighting transformer	TFR 330,207
Overhead door operator	MME 330,205
Supply air fan	F 330, 421
Lighting panels	
Spare	



8.2 How the Electrical Distribution System Works

The electrical systems normally operate automatically; however it is important to understand how the systems work so that if there is a problem, the station will continue to run efficiently. Each of the buses power one small raw sewage pump, one large raw sewage pump, and roughly half of the building's other loads. The Eastgate feeder (bus A) powers odd numbered equipment, and the Phantom Lake feeder (bus B) powers the even numbered equipment and lighting panel. On each feeder, there is a phase failure relay and an under voltage relay. If either relay is tripped, the equipment on on that feeder is shut down, and cannot be restarted until the phase or voltage relays return to normal. Either the utility power must return to normal or the standby generator must start and pick up the load.

Control strategy

Main emergency power system. The emergency transfer switch automatically isolates the failed utility power feed after 5 seconds, starts the standby generator (up to three start attempts) and transfers that feeder's load to the emergency generator. This takes 15 to 30 seconds. The equipment then automatically starts when control strategies call for it to start.

Once utility power has been restored for 15 minutes, the equipment shutdown, the emergency generator is isolated, and the equipment load is then transferred back to the utility feeder. This takes about 25 seconds. The equipment then starts automatically as called for by the system set points. When the generator has run without load for 5 minutes to cool down, then it will automatically shut down.

Fifteen seconds after the generator shuts off the the ATS and generator can be used again.

Control power. An emergency transfer switch automatically transfers the load from the feeder selected[1] on the control panel to the feeder receiving power.

UPS. If both feeders failed at the same time, and the emergency generator failed the UPS will provide power to the control power panel for about 20 minutes to transmit alarm and process data to the DCB at South Plant.

Harmonic dampening filters. (HDF330301 and HDF330302). The harmonic dampening filters smooth out the electrical voltage coming into the station. There is one filter for each incoming feeder line.

Control options

Dual power source. The equipment is distributed between the two feeders. A solid state device triggers the automatic breaker operation during an overload and short circuit. The breaker is reset by pumping the handle four or five times and then pushing the green PUSH TO CLOSE button.

Tie breaker. If necessary a problem feeder could be isolated, and the whole station could be run from one feeder. This crossover is manual and requires closing the tie-breaker between the two main power buses. This should be done by an electrician and Puget Sound Energy must be notified. Manual switching is done with the handle and pushbutton on the front of the unit.

Main bus ATS 1201 and 1202. There is a UNIT OPERATION OFF/AUTO/EMERG START/TEST switch on each ATS panel. The switch should be in AUTO. There is also a digital display. To display the various menus, press NEXT and scroll through the displays.

There is a SERVICE DISCONNET switch with a key, for DISCONNECTED and ENERGIZED (the normal position) .

The following indicator lights are on the panel:

- SERVICE DISCONNECTED,
- NORMAL SOURCE,
- EMERGENCY SOURCE,
- UTILITY TRANSFER BREAKER TRIPPED,
- GENERATOR TRANSFER BREAKER TRIPPED,

1. DON"T SEE THIS SELECTOR

- CONTROLS NOT IN AUTO

The Eastgate ATS also has STANDBY GENERATOR RUN and READY lights and the STANDBY GENERATOR EMERGENCY STOP button

Control power ATS 330,206. There is a TEST/TRANFER TEST/NORMaL switch on the ATS panel to test the UPS. There is an HOA switch on ____ and a selector switch _____. There is no preferred power source; the current power feed is set on the ATS. This panel supplies electricity to the main control panel instruments.

Generator. There is a TEST/OFF/REMOTE / RUN master selector switch on the generator control panel. This switch is normally in REMOTE to allow the ATS to start the generator. In RUN the generator runs continously until the switch is turned to OFF. [1]

There is also a MICRO-PRO-1 controller on the control panel, use the arrow keys to scroll through the menus.

The panel has a power meter, ammeter, volt meter, frequency meter, and selector switches for each phase of the volts and frequency. There is also a hours run meter, a load breaker (which must be closed for the ATS switch to transfer the load.

There are three Emergency-Stops one in the station, one on the generator, and one on the generator control cabinet. All must be pulled out before the generator will run. Push any one to stop the generator; this bypasses the sequential shutdown and cool down.

The status indicator is flashing amber if the switch is not in auto, steady green if the system is ready, flashing green if it is running, red flashing or steady if the emergency stop is pushed in.

Low voltage panels. The MCCs provide power to the control power and lighting transformers that supply the lower voltage panels. The lighting panels are powered from MCC B (Phantom Lake feeder).

Most of the interior lights, and some of the small exhaust fans are operated by control relays in low voltage contactors. When the relays in the control circuit close (24 VDC), the 120 VAC is supplied to the equipment. Several manual switches connecting a single contactor circuit can turn on or off all relays in that circuit.

480 V panels. Many of the 480V contactors also contain contactors activated by 24 VDC control power circuits, these supply 480V AC to the equipment when the relays closes. The switchgear also have lead/follow select switches for most of the auxiliary systems.

UPS. The control power panel load is only half of the UPS's capacity; the batteries can carry this load for 20 minutes. It takes 12 hours to fully recharge the batteries. The system's control panel has voltage, amperage, and frequency meters; and numerous indicating lights. A normally closed external alarm contact opens on a system fault.

Lighting. See page 10-8, *How the Lighting Panels Work*

Alarms

- 24 VDC SYSTEM NO.1, 2, 3, 4 CONTROL POWER FAIL One or both of the 24V DC power supplies located in the main control panel has failed.
- UPS SYSTEM TROUBLE (UPS FAIL MetroTel) There is a problem with the uninterruptible power supply.
- STATION POWER FAILURE(UTIL PWR PHANTOM LAKE FAILED or UTIL PWR EASTGATE-13 MetroTel) One of the 12.5 kV feeders to the station has failed, the emergency generator should start automatically.
- AC CONTROL POWER FAILURE (LOSS OF CONTROL POWER MetroTel) The power transformer that supplies CPP 310,206 has failed or the Phantom Lake feeder has failed and the generator did not start. There is no control power. Contol power panel on UPS. After 20 minutes, there will be no alarms and the RSP 24 V power supplies will not work.
- POWER FAIL LAP panel fuse blown, or station 120 V power out.

Local ATS alarm. A local TRANSFER FAIL[2] alarm registers on the ATS panel, if the ATS breaker trips for any reason, and the generator is NOT started nor is power transferred.

The main bus ATS switch should be activated by:

1. THERE is also supposed to be a HOA switch but I didn't see it in the specs.

2. I don't see this

- Voltage drop out to 336 V, and should note a utility pickup at 432 V (1 second delay)
- Under frequency drop out at 57 HZ (2 second delay) or an over frequency drop out at 63 HZ (5 second delay).

The ATS has alarm indicator lights for the following:

- SERVICE DISCONNECTED, the main service breaker is open.
- UTILITY TRANSFER BREAKER TRIP, the breaker on the _____ is open.
- GENERATOR TRANSFER BREAKER TRIP, the generator breaker is open.

Resetting the ATS alarm. Once the problems that made the system fail are clear, reset the alarm by pressing the two center buttons (the up and the down arrow keys) at the same time. These are also the LAMP TEST buttons.

Local generator alarms. The following alarms have indicator lights on the local generator panel. Each alarm light is also a push to reset button for that alarm.

- WEAK BATT LAMP
- OVERCURRENT

The following alarms register on the local panel display (MicroPro):

- Low oil pressure, high engine temperature, overspeed, overcrank (failed to start), low engine temperature, low coolant level, high AC voltage, under voltage, under frequency, overcurrent, short circuit. all shut down the generator.
- Low coolant level, low oil level, high engine temperature, will all prevent the generator from starting.
- Low battery voltage, high battery voltage, low fuel level, fuel tank rupture, overload, and ground fault, are alarms only.

Resetting generator alarms. If there are alarms, scroll through the menus, clear each alarm and then reset each alarm by pressing the RESET button until the yellow and red flashing indicators disappear.

Resetting UPS alarms. _____

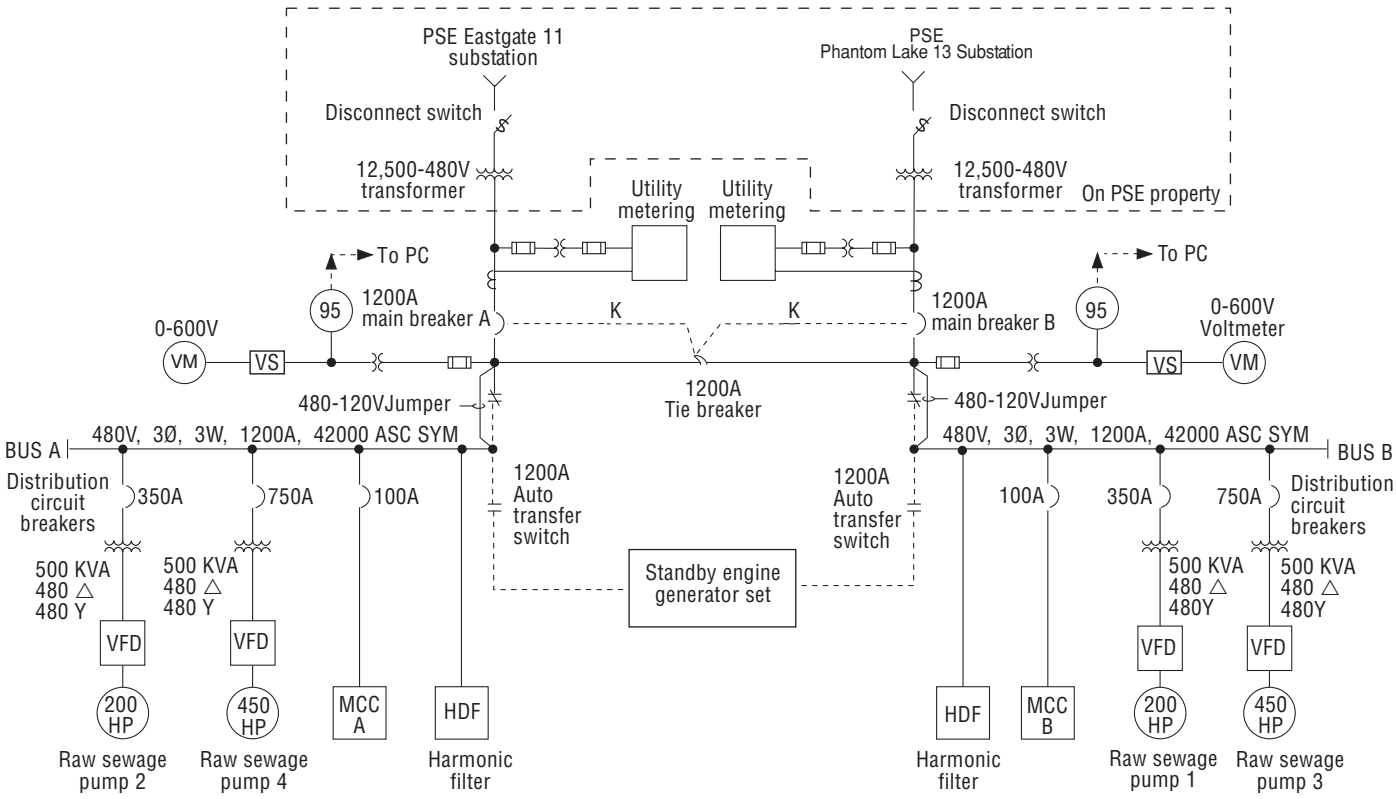
Power outage

The main power will automatically switch to the generator in case of a power outage, and will automatically switch back when the power is restored.

The control power will automatically switch to a powered feeder in case of a power outage in the selected feeder. If both feeders fail a UPS will power the panel for 20 minutes so that alarms can be sent to South Plant.

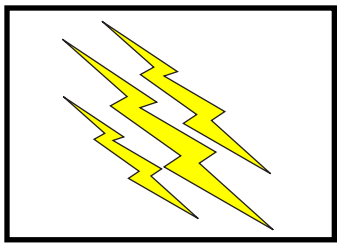
Battery powered emergency lighting will automatically come on and stay on for about 2 hours, if power is restored it will automatically switch of and start to recharge the batteries, it takes about 12 hours to fully recharge the batteries.

Generator and ATS control panel pictures



Legend

A	Amperes
ASC SYM	Amperes short circuit symmetrical
HDF	Harmonic dampening filter
K	Kirk key interlock (2 out of 3 brks may be closed.)
KVA	Kilovolt-amperes
MCC	Motor control center
PC	Programmable controller
PSE	Puget sound energy
V	Volts
VFD	Variable frequency drive
VM	Voltmeter
VS	Voltmeter selector switch
W	Wire(s)
95	Combination phase undervoltage and negative sequence overvoltage
100A	Circuit breaker (100a trip rating)
	Fuse
	Transformer



8.3 Operating the Main Electrical System and Generator

The electrical systems normally operate automatically, however, it is important to understand how the systems work to keep the station running if there is a problem in a power outage. The generator is checked often both with and without load so if a feeder fails the generator will always be ready to pickup the load.

Checking the electrical system

1. **Check the utility supply.**
   Check the voltage on both feeders. The voltage should be 480 volts or above. If voltage is less than 480 volts, note it in the station logbook.
2. **Check the under voltage relays.**
   Make sure the relays are in their normal positions. If any has flipped and/or the red flag is displayed in the phase failure indicator, note the problem in the station logbook and let an Electrician know.
3. **Check the harmonic dampening filters.**
   When checking the harmonic dampening filter, make sure the breaker is not tripped. If it is tripped, reset the breaker. Be extremely careful, as the voltage coming through the filter can be very high.

Exercising the generator

The generator can be exercised with or without a load. Exercising with a load is a true test of the generator, however, you must wait for the generator to cool down and shut off before you can test the second ATS.

CAUTION

Be sure to pump up the breaker 4-5 times or it will not reset properly.

Exercising using the main breaker

Exercising the generator using the main breaker is a true test of the whole system. The main bus breaker must be opened, test the generator with a load. So check how the pumps are configured and whether flows are low enough to go without a pump for 15 minutes. Configure the station for the conditions you find so that loosing a feeder will not cause an overflow. The Eastgate feeder (Bus A) powers odd numbered equipment, and the Phantom Lake feeder (Bus B) powers the even numbered equipment and lighting panel

1. **Open the main breaker.**
   It will take 15 minutes for the ATS switch to change the load to the emergency generator.
2. **Check that the generator came on and stayed on as the load was transferred.**
3. **Pump up the breaker so you can close it.**
   It takes about 5 pumps on the handle to create enough energy to close the breaker.
4. **Close the breaker.**
   The generator should stop in about 5 minutes. Once you have configured the station to test the other feeder, if necessary. Repeat the test by opening the other main breaker.

Exercising with or without a load from the ATS switch

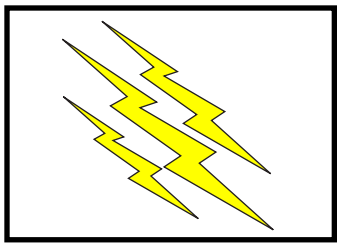
To display the various menus, press NEXT and scroll through the displays.

1. **To test the ATS control**
   a) Press NEXT until the MANUAL TEST MENU is displayed.
   b) Press INCREMENT, select YES, press ENTER.
   c) Press INCREMENT, select an ON LOAD, or OFF LOAD test.
   d) Press ENTER to start the test.
2. **To stop the test**
   a) Press NEXT until the MANUAL TEST MENU is displayed.
   b) Press INCREMENT, select YES, and press ENTER.
   c) Press INCREMENT, select test option NONE, press ENTER.

Troubleshooting the generator and ATS

- Verify all three Emergency-Stops are pulled out, one in the station, one on the generator, and one on the generator control cabinet.
- Verify all three HOA switches are in AUTO, one on each ATS and one on the generator control cabinet.
- Verify there are no alarms or shutdowns displayed on the MICRO-PRO-1 controller located on the generator control cabinet. If there are alarms, scroll through the menus, clear each alarm and then reset each alarm by pressing the RESET button until the yellow and red flashing indicators disappear.
- Verify the 2000A Generator breaker is closed.
- Verify the STANDBY GENERATOR READY light is on. If it is not on, check the bulb. If the bulb is all right, check again for alarms on the ATS. Be sure the alarms were cleared and reset by pressing the two center buttons (the up and the down arrow keys) at the same time. This are also the LAMP TEST buttons.
- Programmable output should display LOAD SHED; transfer logic should display DROPOUT.?[1]

1. NOT SURE ABOUT THIS if this is failure or normal settings



8.4 How the Lighting Panels Work

The Phantom Lake feeder (Bus B) powers the even numbered equipment and lighting panel. The lighting panel handles the lighting, small exhaust fans, associated control circuitry, a water heater, and an instrument air dryer. The lighting panels equipment is not critical to station operation. A separate 120 V control power panel has an ATS switch that automatically switches its supply to the good feeder. Battery powered emergency lighting is placed in critical interior spaces; in a complete power failure this lighting should last about 2 hours.

Control strategy

Outside lighting. The exterior building lights are controlled by photoelectric cells. One cell is dedicated to a single light over an entrance door; additional lights are installed along driveways and walkways.

In HAND all photo electrically controlled exterior lights turn on. In AUTO the photo electric cell turns the lights on when it gets dark. In OFF only the station entrance light will come on at night.

Street pole lights[1]. The pole lamps are manually turned on and off, they are normally left off.

Emergency lighting. The emergency lights automatically turn on whenever utility electrical power is lost or drops below 102 volts (85-percent of 120 volts). The battery will automatically disconnect from the emergency lights when it discharges 80 percent of its fully charged voltage. This protects the battery from being damaged by over discharging. The emergency lighting systems are designed to operate for at least 2 hours after a power failure. The lighting is normally fed from the Phantom Lake feeder.

Control options

Outside lighting. The outside lighting switch is mounted next to the lighting panel. (LC 330,307). A HAND/OFF/AUTO switch on the panel, along with the two roof—mounted photoelectric cells, operates the exterior lights. One photo cell operates most of the exterior lighting; the other cell, above the station entrance, only operates that light. A switch at the south entrance door controls the other exterior lights.

Additional lights with there own photo electric cells are installed along -driveways and walkways.

NOTE: The entrance light may not come on at the same time as the rest of the lights because it has its own photoelectric cell. It is breaker 17 in LP 330,307.

Street pole lights. A switch at the _____ entrance door controls the pole lamps.

Wet well light. The wet well light switch also start an auxiliary fan in the wet well. Turn the lights on 30 minutes before entering the wet well. Turn them off when finished, because this auxiliary fan is not vented through the carbon tower and can cause odor complaints if left on all the time.

Emergency lighting. The 12 volt lead battery has a solid state charger, a transfer circuit, a test switch and charge rate pilot light, voltmeter, ammeter, a load disconnect switch, a brown—out circuit, and an utility power (AC) ON pilot light.

Lighting panel LP 330,207[2]

Lighting panel distributes 120 V to equipment and control devices.

Breaker	Description	Equipment number
1, 3	MCC room lighting and EXIT light and emergency lighting	
5	EXIT light, flow meters, Odor room lighting and restroom lighting	
7, 9	Lighting for motor room and wet well	
11, 13	Lighting for pump room	
15	Rest room exhaust fan	
17, 19	Exterior lighting	
21, 23	Cathodic protection rectifier	

1. Any pole lights at Heathfield????

2. Check these PANEL BREAKERS and add equip nos

Breaker	Description	Equipment number
25	Wet well Ex Fan in HVAC rm DISCONNECTED	
27, 29, 31	Spare	
2, 4, 6, 8	Recepticle ground floor and ?	
10, 12, 14	Recepticle motor rm and pump rm	
16	Spare	
18	Hot wter heater	
20	IA dryer	
22	Spare	
24	Low voltage panel (24 V DC)	
26	CPR	
28, 30	Sprinkliers	
32	Spare	

Control power distribution panel CPP 330,206[1]

The control power panel distributes 120 V control power to various control devises. This system has its own ATS and also supplied by the UPS for about 20 minutes incase of a complete power failure so that alarms and control signals can be sent to South Plant.

Breaker	Description	Equipment number
1	PC power	H10
3	24DC power supply RSP 2	H30 #2
5	Annunciator power supply	H50
7	24DC power supply RSP 3	H70 #3
9	Power strip (recorder, tach)	H90
11	Drainage sump level alarm	H110
2	24DC power supply RSP 1	H20 #1
4	Enclosure plug, telephone and light	H40
6	Power contact output	H60
8	24DC power supply RSP 4	H80 #4

Breaker	Description	Equipment number
10	Mag flow meters	H100
12	Solinoid valve 24V power supply	H120

Changing 120 V control power fuses

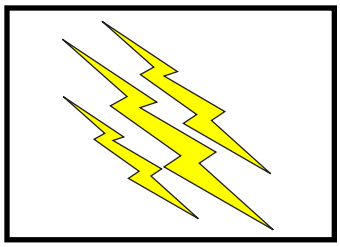
You may change control power fuses on 120 V circuits of the motor controllers from the face of the panel. When the fuse is blown, a neon light glows. The neon gas inside the bulb becomes the power conductor when the fuse melts and can no longer conduct power. To change a control power fuse, do the following:

DANGER

Never remove the face of a 120 V panel.

1. **Twist the bulb to release the fuse holder attached to the bulb.**
2. **Pull the old fuse out.**
3. **Insert a new fuse that has an equal rating (class CC, current limiting, 1 amp, 600 V maximum).**
4. **Reinsert the bulb and fuse holder.**
   Push against the spring tension and twist the bulb clockwise until it catches. The slots will prevent misalignment.

1. CHECK THESE PANEL BREAKERS



8.5 Working Safely with Electricity

Electricity is unpredictable, and it can kill you. It kills by paralyzing your nervous system and stopping muscular actions, including those that control your breathing. In other cases, electricity can strike your heart, causing it to stop pumping. Before working on a piece of equipment, you are personally responsible for locking it out to prevent injuries or death from the unexpected startup or release of stored energy. Any electrical system, regardless of voltage, should be considered dangerous unless you have locked it out and tested it.

DANGER

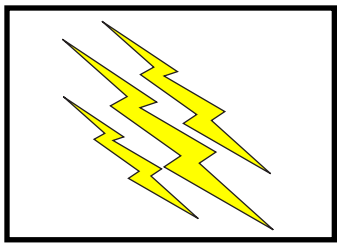
When working around electricity, always follow the rules in this module. Failure to do so may cause serious injury or death.

Rules for working around electricity

Follow these rules when working around electricity:

- **Never attempt any electrical repairs.** As an operator, you are not allowed to make any electrical repairs, except for changing control power fuses on 120 V circuits.
- **Always be aware of potential hazards.** 480 V electricity is the most deadly voltage to deal with, but even 120 V electricity is dangerous and can kill you. Always assume an electrical system is energized unless positively proven (using a testing device) otherwise. Never test a circuit with any part of your body.
- **Never handle 480 V electrical systems.** You may not handle any part of a 480 V electrical system, including 480 V fuses. Never try to defeat safeguards (such as those on motor controllers) that are designed to prevent you from coming into contact with 480 V power. Tampering with safety features not only endangers you, but also your coworkers.
- **Never open a VFD cabinet.** If other equipment is interlocked with the VFD, control power may be active even though the 480 V breaker has been opened (turned off). Even after the power supply is off, the DC link capacitors will hold a charge and you must check the controller with a 0 to 1,000 VDC voltmeter before any work on it is attempted.
- **Never remove the face of a 120 V panel.** You should be able to change control power fuses on 120 V circuits without removing the face panel. Call an electrician if the face panel needs to be removed.
- **Never smoke in the control room.** Explosive hydrogen gas is released when the UPS batteries are charging.
- **Be aware of explosive areas.** Use only non-sparking tools and equipment. Electrical sparks in gas contaminated areas can cause explosions. If you suspect the presence of explosive gas, leave the area immediately. Do not reenter the area until it has been ventilated and tested
- **Always follow correct lockout and tagout procedures.** The ONLY safe way to lock out a piece of equipment is by physically removing the supply power at the source. Open a breaker and place a lock on it to prevent accidental closure. If a breaker cannot be locked, you must have an electrician lift the wire from the back of the breaker panel and tag out the breaker. Some large switchgear must be racked out (physically removed from the bus bar) by an electrician. Tag out the equipment as well, to let others know that work is being performed on it.
- **Never use a latch-type local push button to lock out.** Using a latch-type local push button for lockout is never allowed. These latches are for process purposes only.
- **Always check equipment with the back of your hand.** Protect yourself from electrocution. When checking equipment by feel, always use the back of your hand so that an undiagnosed short does not lock your hand closed around the equipment.

- **Always check equipment with one hand only.** A short can cause electricity to travel up one arm, across your chest, and down the other arm. Serious heart damage or death may result.
- **Prevent grounding when checking equipment.** Avoid standing in water or wet areas and avoid contact with pipes, drains, or metal objects when touching electrical equipment.
- **Keep metal objects away from electrical equipment.** Do not use metal ladders, tape measures, or metal-cased flashlights around electrical equipment.
- **Always inspect electric hand tools and extension cords before using them.** Check tools and their cords for signs of wear. Use only three-prong extension cords and check them for abrasion and insulation failure first.
- **Do not unnecessarily handle equipment.** Operate only the switches and controls necessary to do your job. Do not open electrical cabinets or switch boxes unless you are authorized.
- **Keep equipment clean.** Motors, switches, and control boxes should be kept clean to prevent electrical malfunctions. Notify maintenance if cleaning is required.



8.6 Responding to a Power or Lighting Failure

This module describes the procedures for a station power failure. It also includes procedures for situations where the station power is on but the lights or equipment have failed.

Checking the station during a power failure

1. **Notify Puget Sound Energy.**

DANGERS

Do not engage the main breaker without approval from Puget Sound Energy.

2. **Go to the station and check the generator fuel level, if low order a fuel delivery.**

Power is on but lights or equipment have failed.

Since the station is powered by two feeders, if either all the even or odd numbered equipment is off, then both feeders may be off and the generator can only pick up one. If a large and small pump is necessary they must be run manually and monitored until the power is restored, and then placed back in automatic control.

- If the power outage is isolated to one or several individual piece of equipment, reset the breaker on the MCC.
- If the lights are off, check the lighting panel breaker, or the lighting panel transformer. Emergency lighting will only last 2 hours. The lights are normally powered by the Phantom Lake feeder.

Running on one feeder high flows

In case only one of the station's feeder is receiving power it is possible to run a large and small pump manually. Normally only the small or the large sewage pump will operate automatically, but one large pump can handle normal wet weather flow. If the small RSP is needed the large pump must be put in HAND before the small pump can start.

Using the tie breaker

Switching the main breakers and using the tie breaker circuit should be done by a journeyman electrician, and Puget Sound Energy must be notified before the tie breaker is closed.

Resetting the tie-breaker. Closing a tie breaker is done only in emergencies. The main breaker and tie breaker should be returned to their normal status as soon as possible. Normally it is not necessary to close the tie breaker because one large raw sewage pump can handling most flow conditions and the generator will power one feeder.

1. **Lock open the main feeder breaker with the Kirk key lock.**
2. **Transfer the key to the tie breaker.**
3. **Open all of the distribution breakers on the bus without power.**
4. **Unlock and close the tie breaker.**
5. **Restart the RSPs, large pump first.**

Close the breaker to the large raw sewage pump, wait until the motor starts up, then close the breaker to the small raw sewage pump, wait until the motor starts up, and then close the breaker to the MCC.

Resetting the ATS alarm

Once the problems that caused the system to fail are clear, reset the alarm by pressing the two center buttons at the same time.

Resetting a main breaker

It is necessary to pump the handle on the breaker four or five times before there is enough pressure to reset the breaker.

Resetting a VFD fault

If the fault did not clear automatically, a brief statement should appear on the VFD LCD display if there is a fault. This fault will continue to display until the RESET VFD button is pressed on the MCP, or the drives power is turned off and then back on. If the fault condition has

cleared either method will reset the fault. The alarm must also be acknowledged at the LAP using the ACK button.

Resetting a generator alarm

If there are alarms on on the MICRO-PRO-1 controller, scroll through the menus, clear each alarm and then reset each alarm by pressing the RESET button until the yellow and red flashing indicators disappeared.

Resetting a UPS alarm

Checking the generator fuel level

The diesel tank level can be checked from the level transmitter digital display or from ____.

Troubleshooting the ATS switch

Utility power is restored for more that 15 minutes but the power will not transfer back. Someone has put the ATS switch in TEST, check the LCD display on the ATS switch. The utility power is not within the parameters. Utility power coil is broken, ATS is broken.

Utility power failed, generator running but will not transfer to generator. Generator not producing power within parameters or OUTPUT CIRCUTE BREAKER is open, check the generator control panel. ATS is broken.

Utility power did not fail but generator started and power transferred. Someone has put the ATS switch in TEST, check the LCD display on the ATS. THe ATS is broken.

Generator did not start. Check generator control panel, try the RUN [1]position, if the generator started, check the ATS.

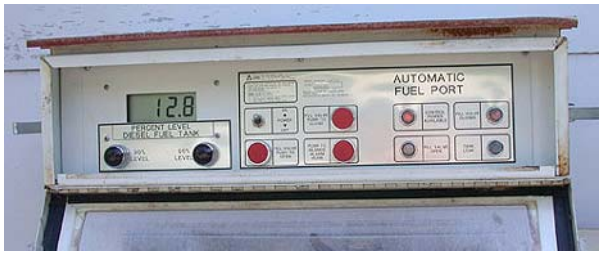
Be sure all three emergency stop buttons must be pulled out.

If a loud click is heard before the fail, check the battery system.

If the engine cranks but doesn't start, check the block heater circuit breaker, and fuel level.

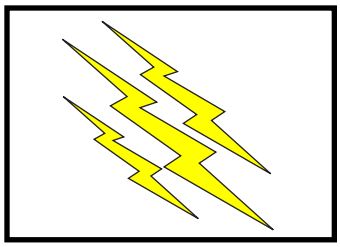
Refueling the generator.

1. **Driver connects the ground cable.**
   Driver connects a ground cable from the truck to the ground stud on the Automatic Fuel Port, left side of panel.
2. **Connect the hose.**
   Unlock the fill box and connect the hose to the coupling. There is a check valve built into the system.
3. **Open the valve on the truck.**
4. **Start the pump on the truck**
5. **Turn CONTROL POWER switch to ON and press the FILL VALVE OPEN button.**
   To stop the delivery at any time press ute CLOSE FILL VALVE button and drain the delivery hose.
6. **Slow delivery at 90% full alarm.**
   There is both a horn and a light at 90% full. The motorized valve automatically restricts the flow of fuel.
7. **Stop delivery at 95% full.**
   There is both a horn and a light at 95% full. The motorized valve automatically closes and stops the flow of fuel. It can not be reopened until the fuel level is below 95% full.
8. **Drain the hose.**
9. **Stop the pump on the truck.**
10. **Close the valve on the truck.**
11. **Disconnect the hose from the fuel port.**
12. **Turn the CONTROL POWER switch to OFF.**
13. **Close and lock the fill box.**
14. **Disconnect the ground cable from the stud.**



Fuel Fill Station

1. There may be a HOA switch here, if so the try HAND with this switch in _____?



8.7 Overview of the Water Systems

There is a potable (Cl) water system and a non-potable (C2) water system. The potable water system provides uncontaminated water for drinking, the bathroom, utility sink, two utility stations, irrigation and makeup water for the non-potable water system. The non-potable water system supplies process water at low pressure for washdown water (C2), and makeup water for the higher pressure seal water system (C2HP). This system supplies seal/flushing water to the RSP packing gland.

City water. Water is supplied by the City of Bellevue. The water line connects to the main running along 163rd Avenue SE. The water meter and shutoff are located in the planting strip just off the road near where the driveway starts; (about 26 feet south of manhole #6). The water line runs through the odor control structure and, buried in the hillside. The city water system is protected from possible contamination by a backflow preventer and a reduced pressure zone. The backflow preventer should be tested at least annually.

A pressure gauge and an isolating valve are located just upstream of a pressure regulating valve (PRV). The water normally passes through the PRV, although a valved bypass line is available in emergencies. The backflow preventer cannot be bypassed. This equipment is located in the odor control room.

C1 water. All application points for the potable water system are located downstream of the backflow preventer so there is no possibility of contamination. C1 water is supplied for the toilet and the sink just outside the rest room, the hose bibs at two utility station. The C1 water pressure at the station is about 40 psi.

Irrigation. The irrigation system uses C1 water, the shutoff is accessed _____. Each of the two zones has an electric valve (inside a valve box) located in the planting areas.

C2 water. The non-potable water system begins at the air gap tank (21/2-foot diameter by 5-foot high) in the motor room. The tank is automatically supplied with potable water by a modulating float control valve (CV330,432) on top of the tank. The tank drain piping supplies the suction header for the seal water system.

The air gap tank has an overflow line to prevent contact between the potable and nonpotable water systems, if the tank should be over filled.

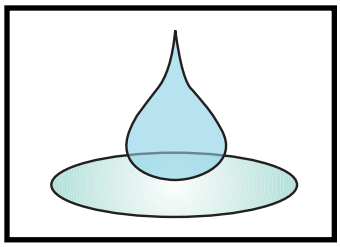
Washdown water. The washdown pump is located next to the seal water pumps. It is a 2 hp centrifugal pump rated at 30 gpm when acting against a 92 foot head.

C2HP water. The non-potable water stored in the air gap tank must be pressurized before it can be used as seal/flushing water. The seal water system, has two seal water pumps and a bladder type expansion tank to provide pressure. The system is located immediately west of the HVAC room on the lower level of the pump station? in the northeast corner of the motor room?[1]

This system provides pressurized non-potable water to the gland seals on the raw sewage pumps. There are two seal water pumps, P330,011 and P330,012, and an expansion tank, PVL 330,013. The regenerative turbine pumps are 1 1/2 hp and rated to supply 2 gpm at 254 feet of head. The expansion tank is connected to the seal water distribution system through a valved line. This 34-gallon bladder expansion tank is charged to 115 psi to provide a system pressure of 90 to 110 psig, and can supply a 5 gpm flow.

1. Check out location

Need picture of shutoff and location info.



8.8 How the C2 Water Systems Work

The nonpotable water system begins at the air gap tank, which is automatically supplied with potable water. The tank drain piping supplies the suction header for the seal water system. The utility or wash down pump pressurizes this water to about 60 psi. The seal water system or C2HP system, has two seal water pumps and a bladder type expansion tank to provide about 90-110 psi.

Control strategy

C2 air gap tank. The tank is automatically supplied with potable water based on level. The air gap tank also has high and low level alarms which register at the MCP.

C2 washdown pump. The pump is manually operated using the START/STOP pushbuttons next to the utility station hose bibs. The pump starts whenever any START button is pressed and stops whenever any STOP pushbutton is pressed. If the pump runs for 30 minutes it will shut down automatically, to prevent accidentally running the pump against a closed valve. To restart the pump press the START button again.

C2 Water System

Seal water (C2HP) system. Normally, the pump is started and stopped automatically based on system pressure.

When the pressure drops below 85 psi, the lead pump is started; it stops at 100 psi. If the pressure falls below 75 psi, the follow pump is started; it stops at 100 psi.

If the pressure falls below 70 psi decr., the low pressure alarm is activated. If the level in the C2 air gap tank falls below 2 feet, neither seal water pump will run.

Control options

C2 air gap tank supply. A modulating float controlled supply valve (CV330,432) is located on top the tank. The tank drain piping supplies the suction header for the seal water system.

Seal water (C2HP) system. A power disconnect switch, a LOS pushbutton, and a TEST push-button are located next to each pump motor. A lead pump selector switch is on the MCC.

Washdown pump. There are START/STOP push buttons near each utility station.

Alarms and interlocks

- SEAL WATER PRESSURE LOW (PSL 331,013) C2HP pressure is less than 70 psi decr., shuts down the RSPs or prevent them from starting. RSP 3 will run in fill-and-draw. Seal water pumps have failed or there is a broken pipe.
- AIR GAP TANK HIGH LOW (LALH-331,431) The floats in the break tank (mfg set) have tripped.

Air gap tank interlock. If the level in the C2 air gap tank falls below 2 feet, neither seal water pump will run.

Power outage

The odd and even numbered equipment is powered from different busses, the follow pump should start automatically on set point if the lead pump's bus is out. The washdown pump is fed from bus A.

8.9 Overview of the Irrigation System

The irrigation system runs on city water. It is controlled by a timer in the Rainbird controller located on _____. The cap is located _____odor control room? [1]Each of the two zones has an electric valve (inside a valve box) located in the planting areas. The irrigation system should require little operator time.

Control strategy

Irrigation system. The irrigation system is controlled automatically by a timer. The timer turns the different parts of the irrigation system off and on.

Control options

Control valves. Each section of the irrigation system has its own control valve. This valve is opened and closed by the main timer.

Shutoff. The shutoff is accessed through a 4-inch PVC sleeve. The cap is located _____. Each of the two zones has an electric valve (inside a valve box) located in the planting areas.

Controller. The controller is located on the wall near _____.

Alarms

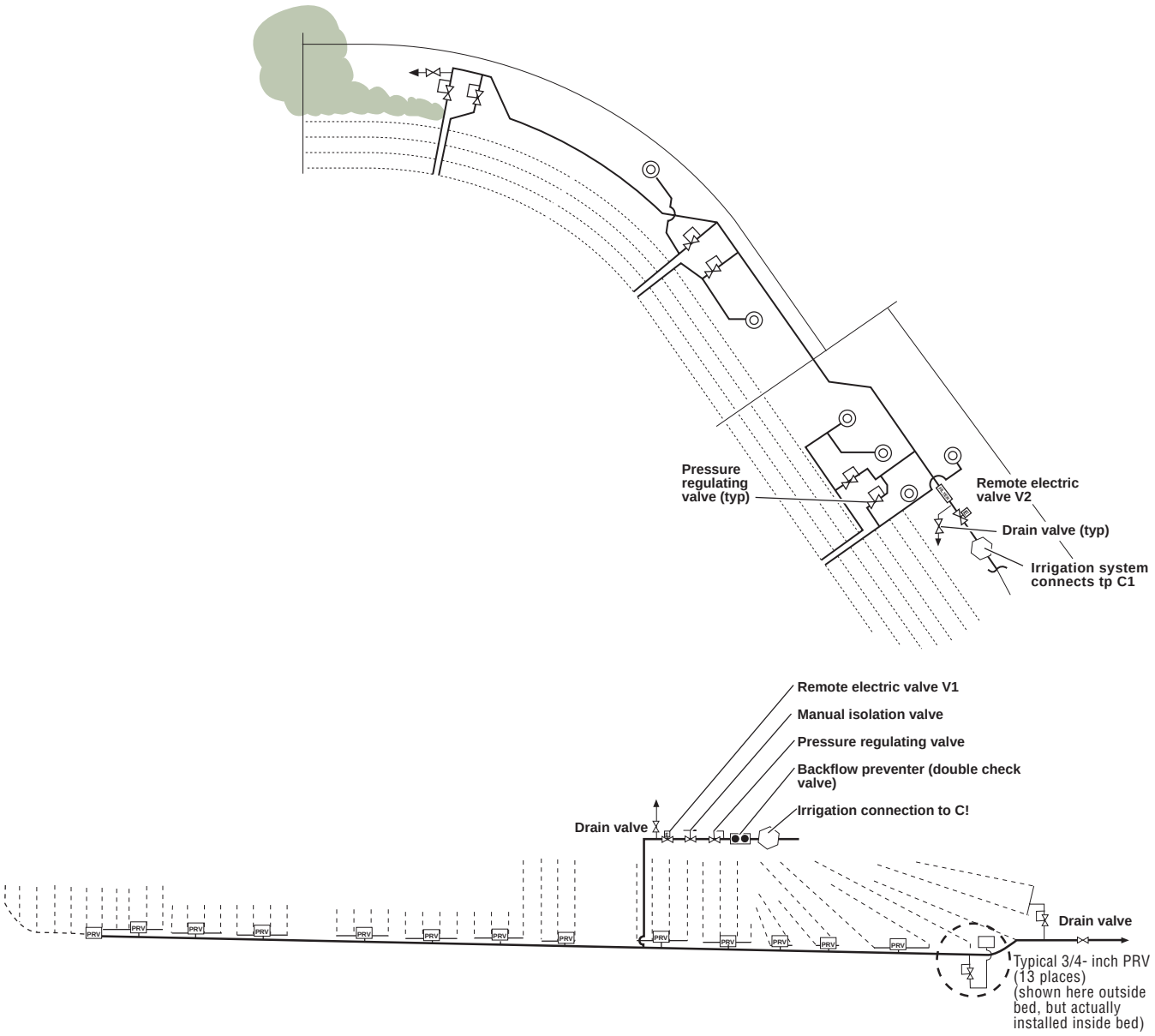
There are no alarms associated with this system.

Power outage

The irrigation system is on CKT ___ in panel ____. In case of a power outage the irrigation system timer may need to be reset.

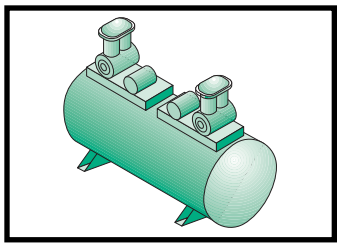
To reset the timer. Do something_____

1. Need shutoff and controller locations and pictures



Heathfiled iffigation diagram

SECTION 9
Auxiliary Systems



9.1 How the Instrument Air System Works

The instrument air (IA) system supplies water- and oil-free compressed air to the bubbler level sensors. Proper operation of the air system is essential for the PLC and backup level control programs to work. The air system includes two compressors mounted on a single receiver tank. The compressors run automatically in lead/follow and are controlled by pressure switches. Manual controls on the air system are for configuring the system for automatic operation and testing the compressors. Manual controls are located on local push button station mounted on the wall behind the compressor.

Overview

Compressors. The IA system has two 0.5 hp air compressors, each capable of producing 1.6 scfm at 125 psig. They use 3-phase 460 VAC. Both compressors discharge to the same receiver.

Receiver. The 30-gallon air receiver has a pressure switch, a check valve, a pressure gauge, and a relief valve. It is equipped with a float-actuated automatic drain valve and a manual air isolation valve.

Air dryer. The dryer is a two-tower desiccant air dryer that is self-regenerating[1]???. It is equipped with a float-actuated automatic drain. The air dryer can dry the flow of one compressor to a pressure dew point of less than minus 40° F. The humidity can be monitored from a transparent silica gel reservoir installed on a side stream of the air dryer discharge. The silica gel changes color from blue to pink when the relative humidity of the air exceeds 10 percent.

Control strategy

Compressor. The IA system operates automatically, based on the pressure in the receiver tank. The lead compressor starts whenever the receiver pressure drops below 55 psig and stops at 70 psig; the follow compressor starts at 45 psig and stops at 60 psig.

Air dryer. The air dryer is turned on all the time, and operates whenever the compressors operate.

Receiver drain valve. The receiver drain valve opens whenever the float is lifted by the water in the tank; it closes once the water drains.

Instrument Air System

Control options

Compressor. Local STOP/TEST buttons are mounted on the wall near each compressor. The LEAD/FOLLOW switch is on the MCC. There is a TEST/STOP button an the wall near each compressor. READY (green) and RUNNING (red) status lights are displayed on the MCP.

Air dryer. The air dryer has an OFF/ON switch. [2]

1. The dryer was replaced recently and I have to get the specs on the new one.

2. Check out for the new dryer.

Receiver drain valves. In addition to the automatic drain valve, there is also a manual drain if the automatic drain fails.[1] The automatic drain valve has a POWER ON light.

Alarms

- INSTRUMENT AIR PRESSURE LOW (PLS 331,113) (INSTR AIR PRES LOW MetroTel) Pressure inside the air receiver tank has dropped below ____ psi. Also indicates the follow compressor has come on.

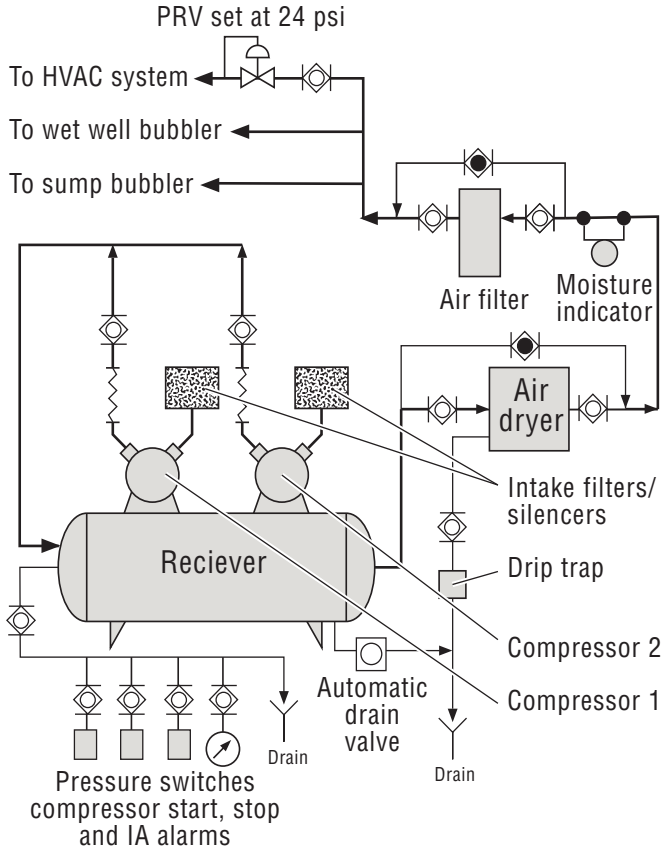
Power outage

The IA compressors breakers are at the MCC. The air dryer plugs in to the wall, the receptacle is CKT 20 in LP 331,207.

Testing the instrument air alarm

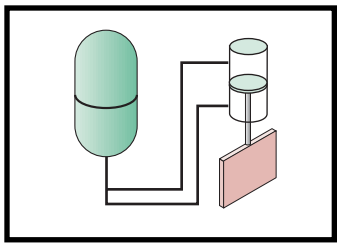
The most frequent cause for IA compressor failure is a bubbler left in purge. Aside from disabling the bubbler, the constant demand for high pressure air places too great a load on the small IA compressors.

1. **Check the air pressure.**
   Read the IA pressure gauge. A normal reading is 60 to 70 psi.
2. **Lock out the IA air compressors.**
   Lock the local STOP button in position on compressor 1 and 2.
3. **Bleed off the air from the receiver.**
   a) Slowly open the air/water bleed off valve at the bottom of the tank, lower right.
   b) When the pressure on the gauge is less than 25 psi close the valve.
4. **Wait for the alarm to register.**
   It should take about 30 seconds for the alarm to register.
5. **Restart the compressors.**
   Unlock the STOP button. The compressor should start and run until the pressure is 65 to 70 psi, and then stop.
6. **Clear the alarm.**
   Go to the control panel and clear the alarm.
7. **Verify the alarm is clear at the DCB.**
   Call the DCB and verify the alarm came in and is clear.



Insturment air system

1. check out if still there.



9.2 Overview of the Hydraulic Systems Work

The Heathfield Pump Station has one hydraulic system that operates the raw sewage pump (RSP) discharge ball valves. The hydraulic system uses pressurized oil stored in accumulators to move the cylinder operators for the discharge ball valves. If the hydraulic system fails each valve is equipped with an emergency accumulator that can close the RSP discharge ball valve once. Once the emergency accumulator closes the valve the RSP can not be restarted until the hydraulic system is operating normally. The hydraulic systems is also called the fluid power system.

Overview

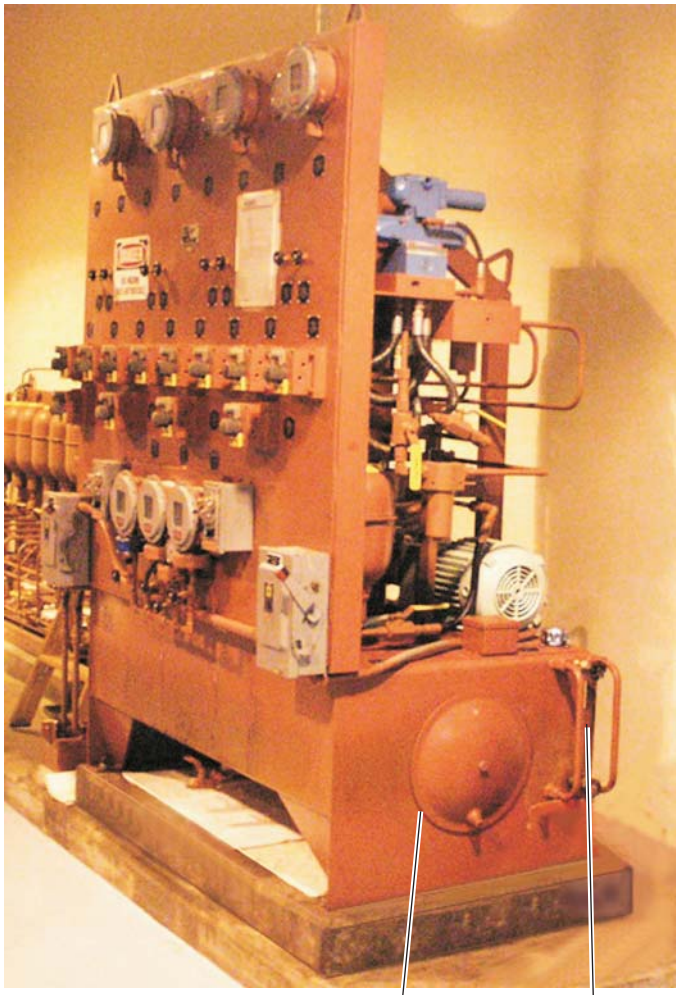
The hydraulic system has two fluid power pumps, a hydraulic fluid storage reservoir, hydraulic accumulators, and associated valves, gauges, switches, filters, piping, and accessories. The fluid power accumulators are mounted together in freestanding steel frames, forming an accumulator bank.

The RSP discharge ball valves isolate offline RSPs from the high head in the force mains, much like a check valve. The valves are opened and closed at specific times during pump startup and shutdown. The rate of the valve movement is controlled to prevent water hammer damage and prolonged reverse rotation of the RSPs.

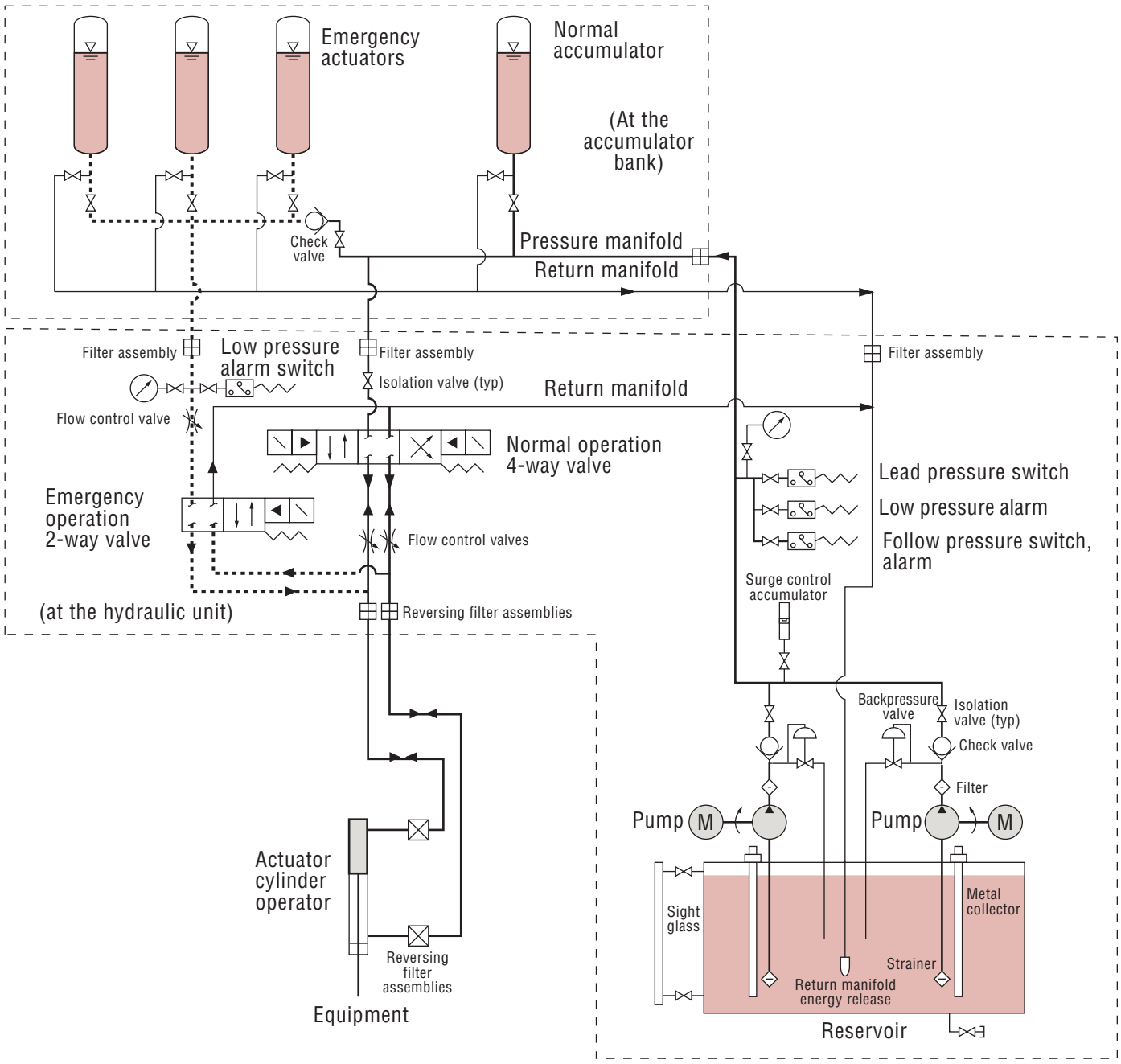
The RSP discharge ball valve system has two 5 hp piston pumps, capable of discharging 5 to 6 gpm at 2,000 psi. The pumps can run up to 1,800 rpm and use three-phase 460 VAC. the normal accumulator bank has four 2-1/2 gallon 1,200 psi accumulators that can recharge in 10 minutes. The emergency accumulator bank has eight 2-1/2 gallon 1,200 psi accumulators that can recharge in 10 minutes.

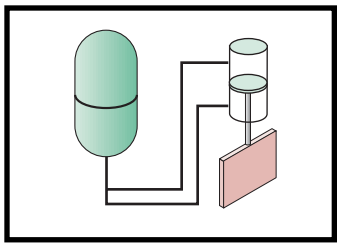
The ball valve fluid power system has one cylinder operator for each of the four sewage pump discharge ball valves. They normally use nitrogen, precharged. Bladder type accumulators are connected to the cylinder operator through a 4-way, 3-position double-solenoid valve, which is spring-centered. As the solenoid valve opens and closes, it opens and closes sets of ports that allow the fluid to move in the cylinder which opens and closes the discharge ball valves. When the cylinder operator is in the center position, all the ports are closed and no hydraulic fluid can move. The position of the RSP discharge valves is locked.

The emergency accumulators are similar; however, they have normally-open, 2-way, 2-position solenoid valves that close the valve when activated. The system has a 109-gallon fluid reservoir with strainers, metal collecting magnets, a sight glass, and a fill-breather unit.



Hydraulic System


Emergency actuators
Normal accumulator
(At the accumulator bank)
Check valve
Pressure manifold
Return manifold
Filter assembly
Low pressure alarm switch
Filter assembly
Isolation valve (typ)
Return manifold
Filter assembly
Flow control valve
Normal operation 4-way valve
Lead pressure switch
Low pressure alarm
Follow pressure switch, alarm
Emergency operation 2-way valve
Flow control valves
Surge control accumulator
(at the hydraulic unit)
Reversing filter assemblies
Backpressure valve
Isolation valve (typ)
Check valve
Filter
Pump
M
Pump
M
Actuator cylinder operator
Sight glass
Metal collector
Strainer
Return manifold energy release
Reversing filter assemblies
Equipment
Reservoir



9.3 How the Hydraulic System Works

It is important to understand how the hydraulic system works because it a key component of the raw sewage pumps (RSP). While electricity is needed for the normal operation of the hydraulic systems, once the emergency accumulators are fully charged, they can close the RSP discharge valves. Therefore, even though it is unlikely to occur, a complete loss of electrical power will not result in flooding the wet well or prolonged reverse rotation or water hammering the pumps. If the RSP discharge valve system or the speed controller fails, the RSPs will stop or be prevented from starting.

Control strategy

RSP discharge ball valves. The RSP speed controller normally signals the discharge ball valve hydraulic systems to open or close the valve based on pump speed. A pressure switch on the hydraulic system will stop the RSPs and cause the emergency accumulators to close the valve. It takes about 45 seconds to close a valve.

Power outage. In case of a power outage, the hydraulic system emergency accumulators will close the valves. The valve will automatically reopen when power is restored.

Hydraulic pumps. The fluid power or hydraulic pumps on both systems provide pressurized oil for the accumulators and start and stop on the same pressure set points. At 1,100 psi, the lead pump starts; the low pressure alarm is cancelled and the lead pump stops at 1,200 psi. At 950 psi, the low pressure alarm registers and the follow pump starts; the follow pump stops 1,050 psi.

NOTE: *Switch A turns the lead pump on and off. Switch B generates the FLUID POWER PRESSURE LOW alarm that registers on the MCP, starts and stops the follow pump, and resets the low alarm when the follow pump starts. Switch C is not used. Switch D is on the emergency accumulator piping If the pressure in the emergency accumulators is low, switch D opens and stops the RSPs from starting.*

Control options

Hydraulic pumps. The fluid power pumps have local STOP/TEST buttons. The STOP button overrides all control and stops the pump. Pressing and holding the TEST button starts and runs the pump. READY (green) and RUNNING (red) status lights are displayed on the MCP.

Lead/follow select. The fluid power pumps have a LEAD/FOLLOW switch on the MCC. Once the operator chooses the lead pump, pressure switches control the RSP discharge ball valve hydraulic system.

Discharge ball valve closure times. Surge analyses performed during station design determined the proper emergency discharge ball valve closure rate, which was 30 seconds for the Heathfield. This closure time resulted in a pressure rise of only a few psi above operating pressure and the valves operated smoothly. When a 10-second closure was tried, the pressure increased to 300 psi. Intermediate closure times had lower surge pressures, but also generated excessive stress on the valve control hardware, causing valve to jump back against the hydraulic operator.

CAUTION

Be careful not to do anything which may alter actuator operation timing.

NOTE*: Proper settings for the emergency closure rate for the raw sewage pump discharge ball valves are critical to line surge pressures after a power loss to operating pumps. There are no visual indicators for actuator closure timing, other than witnessing an actual closure.*

Alarms

- BALL VALVE FLUID POWER PRESSURE LOW (PSL 330,101) (BALL VALVE HYD PRES LOW MetroTel) The hydraulic system does not have enough pressure (1,050 psi resets at 1,100 psi; MetroTel III at 500 psi) to open/close the RSP discharge valves. The RSPs are stopped, the emergency accumulators close the valves. Must be manually reset at the MCP before the RSPs will restart.

Power outage

When utility power is lost, all the open discharge ball valves are closed.

Because the 45-second delay in closing the discharge ball valves, fluid does flow back through the pump while the pump is still running forward. As the pump coasts to a stop and the flow makes it reverse direction until the valve has closed. When the flow reverses, especially while the pump is still coasting forward, the turbulence in the pump casing is VERY noisy. These pumps are designed to coast in reverse and it will not damage the pump.

CAUTION

DO NOT restart a RSP while it is running backwards or else the pump, shaft, and motor will be destroyed.

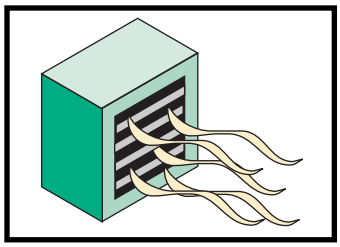
Any water that runs back into the wet well during an emergency controlled valve closure will be contained by the wet well or overflow to local sewers.

Checking the hydraulic system

During routine checks of the stations, be sure to check the fluid power system's control pressures.

It is very important the hydraulic fluid be kept scrupulously clean. Abrasive substances in this fluid greatly accelerate wear and may lead to system failure and drastically increased maintenance costs. Periodically have the fluid analyzed to check for potential problems; for example, the presence of small metal filings would indicate the need for more extensive testing and trouble-shooting.

Check all flexible tubing and verify there are no leaks in the system.



9.4 Overview of the HVAC Systems

The heating, ventilating, and cooling (HVAC) system provides a safe working environment for operating personnel, and by maintaining a temperature range and enough ventilation, greatly reduces condensation, offers reliable process equipment operation, and reduces maintenance on both structures and equipment.

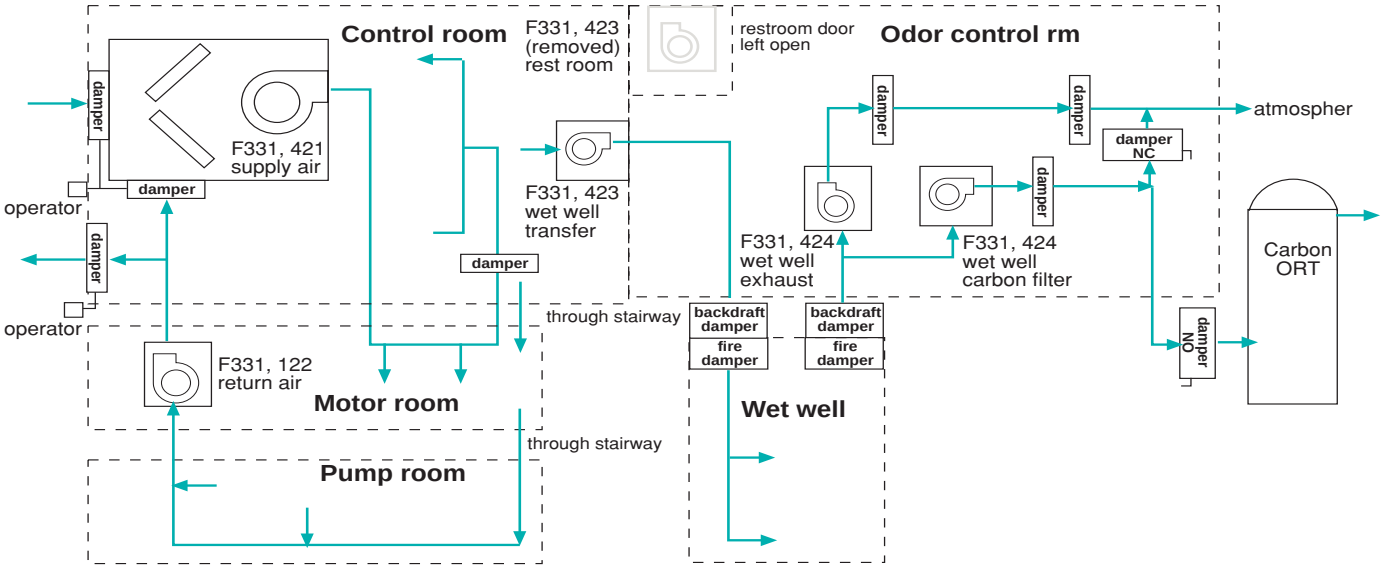
Overview

The HVAC equipment consists of centrifugal fans, dampers, ductwork, and associated instrumentation and control devices.

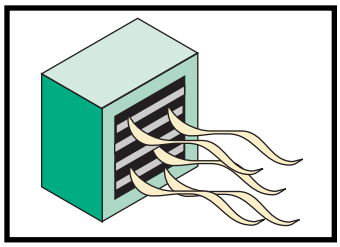
All fans are motor-driven with a V belt, except the washroom exhaust fans (F 330,226 and F 331,426) which is has direct drive. The speed of the fixed speed belt-driven fans can be changed slightly by adjusting the belt sheave width. The wet well transfer fan can be operated at either slow or fast speeds (two times the slow speed).

To help eliminate odors most of the exhaust air from the wet well is routed through a carbon scrubbing tower. This system is covered in *Section 10, Odor Control*.

Equipment number	Description	Capacity, scfm	Static pressure, inches W.C.	Fan speed, rpm	Motor hp	Operating voltage
F 330,022	Return air fan	12,450	1.5	1,200	7.5	460
F 330,123	Wet well transfer fan	1,500/750	0.25	1,750/875	0.5	460
F 330,221	Supply air fan	13,200	1.125	1,000	5.0	460
F 330,224	Wet well exhaust fan	800	0.625	1,600	0.25	115
F 330,225	Carbon filter fan	800	8.0	3,000	3.0	460
F 330,226	BDD damper (washroom exhaust?)	200	0.125	1,050	0.025	115



HVAC diagram



9.5 How the HVAC Systems Work

It is important to understand the heating, ventilating, and cooling (HVAC) system because it provides an environment that is safe for operating personnel, offers reliable process equipment operation, and reduces maintenance on both structures and equipment. Air is circulated through areas where sewage gases might accumulate so that toxic or explosive conditions will not occur. Other interior areas are maintained within a temperature range and provided with enough ventilation to greatly reduce condensation.

Control strategy

Ventilation system. The supply air and return air fans (F330,203/4) normally run continuously. A thermostat is used to adjust the positions of the exhaust air, return air, and outside air dampers. The portion of outside air to return air controls the temperature. The dampers have mechanical stops that maintain at least 10 percent outside air.

A ventilation failure alarm registers after 20 seconds when the supply fan starts but the differential pressure across the supply fan is not high enough.

Wet sell ventilation. In AUTO, the wet well transfer fan (F330,423) and the carbon filter fan (F330,425) run continuously. Normally, the transfer fan runs at slow speed. When the wet well light is switched on, the wet well transfer fan speed is doubled (fast speed) and the wet well exhaust fan is started. When the wet well light is turned off reverse occurs. The carbon filter fan is also apart of the odor control system.

Control options

Controls for the fan motors are located at the MCC and/or near the motor.

Return air and supply air fans. The return air fan has an OFF/RUN switch on MCC A, with STOP/TEST buttons next to the fan. The supply air fan must be running before the return air fan can be started. However, the RUN switch position and the TEST button for the return air fan also start the supply air fan, although there might be a slight delay.

The supply air fan also has STOP/TEST buttons next to the fan in the HVAC room.[1]

Wet well transfer fan. The wet well transfer fan is a two-speed unit. It has a HAND/OFF/AUTO and a SLOW/FAST switch on MCC B. STOP/TEST and SLOW/FAST buttons are next to the fan in the wet well.

When the speed selector switch is set to FAST, the fan runs at high speed whenever it operates; this can be over ridden by the local pushbuttons. (The transfer fan always runs at high speed if the TEST and FAST buttons are pressed.)

When the speed switch is set to SLOW, fan speed depends on the position of the HOA switch and whether the wet well exhaust fan is running. In HAND, it runs at low speed. In AUTO, the transfer fan runs at low speed when the wet well exhaust fan is not running, and fast when the well exhaust fan is started. The SLOW/FAST switch on the MCC remains in SLOW and transfer fan returns to slow speed when the exhaust fan is stopped.

DANGER

When MCC B is not running normally from utility power, the fans will not start.

Wet well exhaust fan. The fan has a local manual-motor-starter mounted on a wall near the fan in the odor control room. Normally this switch is ON. The fan is started and stopped by the light switch inside the wet well access door; the fan turns on and off with the light.

If there is not enough pressure differential by a differential pressure switch in the discharge duct, a WET WELL EXHAUST FAN FAILURE alarm registers.

Washroom exhaust fan. A single wall switch controls both the light and the exhaust fan. This fan has been removed.

1. Check out switch locations

Carbon filter fan. The carbon filter fan has an OFF/RUN switch on the MCC and local STOP/TEST buttons.

HVAC instruments. Various temperature controllers, pressure gauges, duct pressure switches, and pressure differential gauges monitor the system. One thermostat is mounted (at Sunset, near the outside south corner of the HVAC room; at Heathfield, on the north wall of the control room, near the top of the stairs). It is a two-pipe pneumatic type thermostat. The Magnahelic differential pressure gauges are used to measure filter cleanliness. They have a zero adjustment, an adjustable signal flag, and a vent valve.

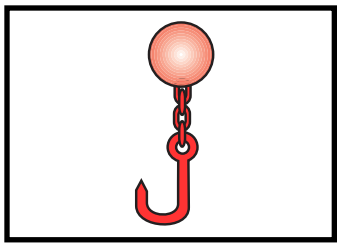
Temperature regulating dampers. The HVAC systems depend on pneumatic controls to operate the dampers. The pneumatic control panel is in the HVAC room. The compressed air is supplied by the instrument air system and regulated to 20 psig.

Entering the wet well

DANGER

The Heathfield Pump Station wet well is a permit-required confined space. Open the wet well access door only far enough to reach inside and turn on the light switch that starts the exhaust fan.

If the wet well transfer fan is in AUTO, the wet well should be ventilated for at least 30 minutes before anyone enters the wet well area. Use your own meter to check the wet well before entering. Continuously monitor the air quality inside the wet well for hydrogen sulfide, explosive gases, and oxygen content.



9.6 How to Work Safely with the Trolly Hoist

The Heathfield Pump Station has four 3-ton monorail hoists (C330, 070, 071, 170, and 1711)) installed in the station. They each have a single-girder with a geared trolley and a manually-operated chain hoist. There is a roll door in the pump room to remove equipment.

Overview

Each hoist is rated to lift 3 tons, and is rated to lift 16 feet. Each requires 71 pounds of pull on the chain to lift the 3 tons and 17 pounds of pull to pull the trolley along the track. They have a minimum radius curve of 96 inches.

Control strategy

Each hoist is manually operated as needed.

Control options

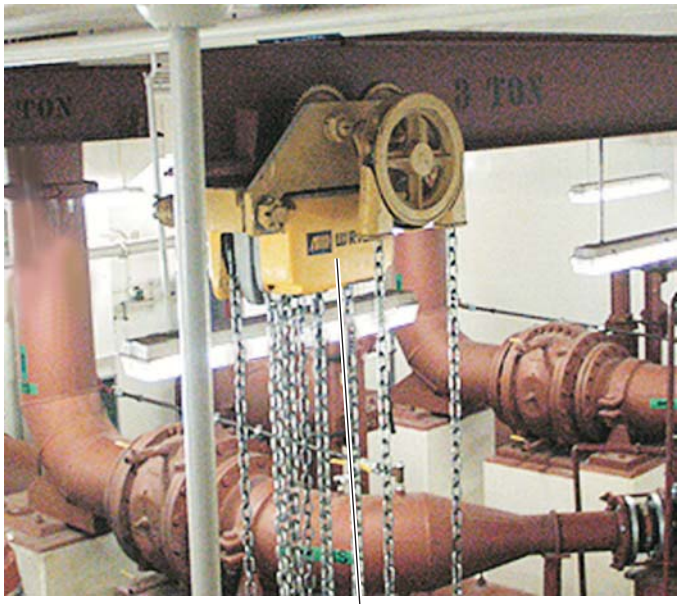
The hoist is operated with a chain.

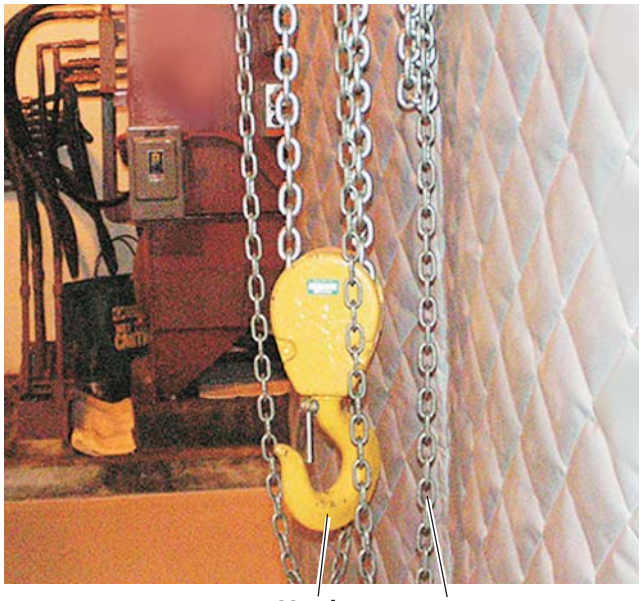
Alarms

There are no alarms associated with the trolley hoists.

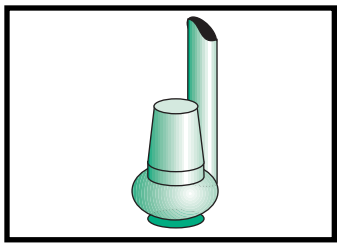
Power outage

The trolleys are gear-driven and require no electricity.





Trolley Hoist



9.7 How the Drainage System Works

The drainage systems collect, transport, and dispose of all liquid wastes originating at that the station. The drainage streams fall into one of two broad categories: stormwater, which can be discharged directly to surface water with no treatment, and sanitary sewage which must be treated before discharge.

Rain water and subsurface water usually receive no treatment before flowing into Lake Sammamish. The floor drains, and equipment drains, roof drains, and the pig launching area slab drains go into a stormwater detention basin on the property and from there to a 48-inch stormwater line that ends in Lake Sammamish. There is also a stormwater system next door that does not belong to King County that has pipes that flow through the back of the property to a drainage sale, from there this flow ends up in Vasa Creek.

Sanitary sewage from rest room and service sink, discharge to the Sunset Pump Station wet well to be pumped to South Plant.

Overview

Stormwater drain system. The stormwater from the station roof, floor drains, and the surface water collected by two catch basins along the side of the driveway empty into a stormwater detention basin on the property and from there are conveyed by gravity into Lake Sammamish.

Sanitary drain system. The sanitary drain system includes the wastes collected by the rest room toilet and utility sink. The waste is sent to the Sunset Pump Station wet well through an 8-inch sewer line that travels through manhole 6.

Dry well sump. The dry well has a sump containing two vertical, non-clog, submersible sump pumps that discharge to the wet well. Each of these sump pumps has a rated capacity of 280 gpm and is powered by a 5 hp motor. Pump motors operate at 1,750 rpm and receive 460 volt, 3 phase, 60 Hz electricity from the motor control centers. The sump discharges into _____.

Control strategy

Sump pumps. The sump pumps start and stop on level set points. The lead pump starts at 36 inches incr., and stops at 18 inches decr. The follow pump starts at 60 inches incr., and stops at 42 inches decr.

Control options

Lead/follow select. A lead/follow selector switch is located at the MCCs and STOP/TEST buttons are mounted on the wall near the pumps.

Level switches control the sump pumps automatically. A bubbler monitors the sump level. The instrument air system supplies the air for these controls. The bubbler control panel is on the wall. It has a plunger type purge control.

Alarms and interlocks

- DRAINAGE SUMP LEVEL HIGH (LSH 331,005) Sump is at ___ inches incr. Failure of the sump pumps due to a clog, closed discharge valve, seal failure, or high motor winding temperature.
- DRAINAGE SUMP LEVEL LOW (LSL 331,005) Sump is at 6 inches decr. Sump pump(s) has not shut off.
- DRY WELL (MetroTel PUMP ROOM FLOODED or DRY WELL FLOOD) Float switch near_____ has floated. Shuts down all the RSPs.

Power outage

Sump pump 1 is powered from MCC A; sump pump 2 is powered from MCC B.

Checking the dry well alarm

1. **Send an alarm and test the sump pump.**
   a) Locate the float—it is on the lowest level (pump room), on the north wall at the east end of the sump.
   b) Lift up the float and hold it up for 30 seconds. The sump pump should start, and the alarm should register.

c) Release the float. Check that it hangs freely. The pump stops as the level drops.

2. **Clear the alarm.**
   Push the RESET button on the control panel.

3. **Verify the alarm with the DCB.**
   Contact the DCB, verify the alarm came in and is clear.

Operating the sump pumps

To operate the sump pumps manually, press and hold the TEST button next to the pump.

Purging the sump pump bubbler

1. **Check that the rotameter is operating at 0.8 scfh.**

2. **Push the plunger in as far as it will go.**

3. **Wait 30 seconds while the bubbler tube is purged.**
   You can tell that the tube is being purged by the sound of air coming from the panel or by watching the rotameter float bounce in the sightglass.

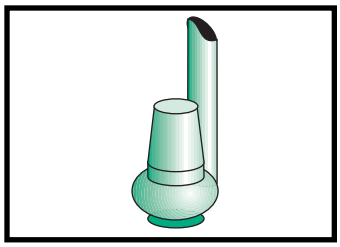
   NOTE: *If the bubbler is measuring the level of a liquid that is particularly thick or gritty, you may need to purge the bubbler tube for more than 30 seconds.*

4. **Place the plunger in the detent position.**
   The plunger should click positively into the detent position, which is about halfway between the purge position (fully depressed) and level-measuring position (fully extended).

5. **Wait at least 15 seconds for the bubbler to stabilize and pressure to settle down.**
   This prevents damaging shock to the diaphragm or bellows.

6. **Pull the plunger all the way out.**
   Failing to return the bubbler to the normal position will disable sump pump control and tax the IA compressors.

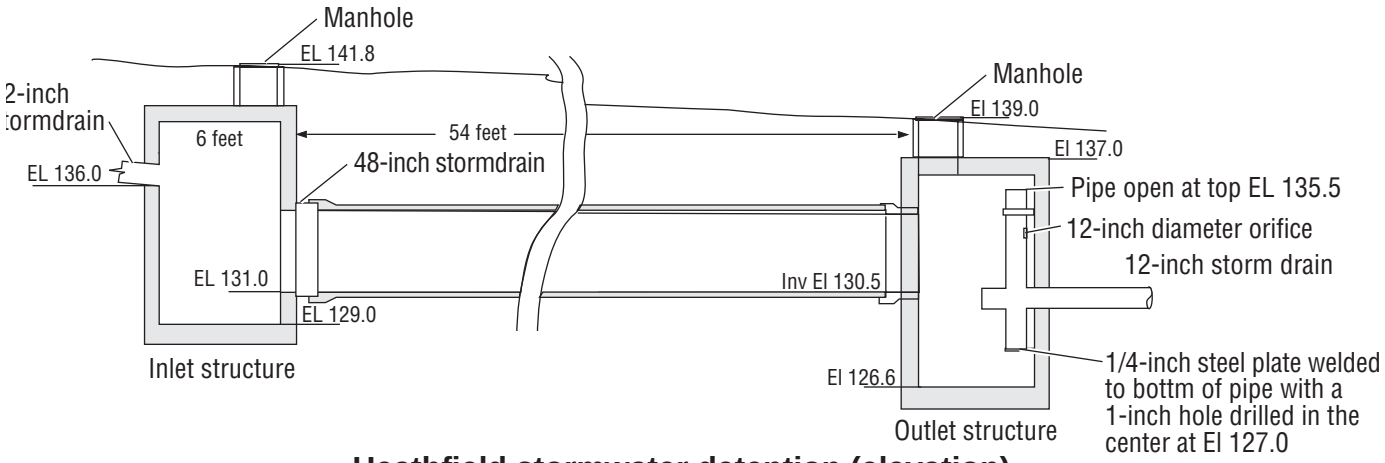
7. **Recheck the rotameter reading.**
   It should be 0.8 scfh.



9.8 Hosing the Stormwater Detention Basin

The stormwater detention basin has become a source of odor complaints at the Heathfield Pump Station. The basin should be hosed out annually, and after any overflow large enough to send raw sewage into the basin. A rubber flap is installed on the 12-inch inlet from manhole 6 to reduce odors caused by the cross connection to a sanitary system. Hosing the basin requires the VAC truck and two operators.

1. **Schedule the Vac truck**
   Fill out a work request with maintenance.
2. **Locate the stormwater detention structure inlet and outlet manholes.**
   - The inlet manhole is at the edge of the gravel road at the turn into the station driveway.
   - The outlet manhole is 40 feet back down the gravel road toward the street.
3. **Position the Vac truck at the outlet manhole.**
4. **Test the air quality inside the manhole.**
   Test both the inlet and outlet manholes.
   a) Use the manhole hook to punch out the silicone seal from one of the holes in the cover.
   b) Feed about 10-feet of sample hose through the hole at the inlet side (12-feet at the discharge side).
   c) Sample the air quality.
5. **Remove the manhole cover.**
   Remove both inlet and outlet manholes. Place cones around the openings.
6. **Vacuum out the outlet manhole.**
   Keep the water level in the outlet manhole well below the top of the horizontal overflow discharge pipe.
7. **Clean the inlet manhole.**
   Use the water hose from the Vac truck to hose down the manhole.
8. **Clean the detention basin.**
   Continue to flush the inlet manhole and detention basin with clean water. Vacuum out at the outlet manhole.
9. **Clean the outlet manhole.**
   Hose down the outlet manhole while vacuuming out.
10. **Hose out the orifice on the horizontal overflow discharge.**
    Direct a steady stream of water down the orifice. Flush for several minutes.



Heathfield stormwater detention (elevation)

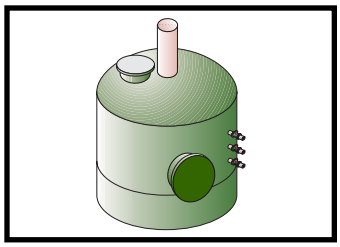
Stormwater detention basin inlet manhole

Stormwater detention basin outlet manhole

Inlet manhole

Outlet manhole

SECTION 10
Odor Control



10.1 An Overview of the Odor Control System

Some gases generated by raw sewage when concentrated can be dangerous. The only place in the station where such concentrations are likely is in the wet well, so the wet wells are continually ventilated. If the wet well fans are not running, the wet well is a permit-required confined space and all confined space entry procedures must be followed. You may need to ventilate the wet well with a portable fan.

Because sewage gases often have a foul odor, exhausting them untreated to atmosphere may cause odor complaints from the neighbors. Removing the odor from the wet well exhaust air is important for good community relations. Blowing the air through a bed of activated carbon where the odors can be absorbed prevents odors. Eventually, the surface of the carbon is full of trapped chemical compounds and must be changed.

Overview

Odor control. The odor removal system consists of the carbon filter fan, the carbon filter unit, louvers, ducting, and the associated controls and instrumentation. The carbon filter unit is rated to treat hydrogen sulfide (H_2S) at 35 ppm, at up to 180°F, with a bed depth of 3 feet and a maximum velocity of 50 fpm.

Carbon Filter Unit

The carbon units, open at the top, have a 3-foot thick bed of activated carbon supported by a mesh screen. Each unit has: an inlet duct, an outlet duct, a drain, an overflow, a water connection, a grounding rod, a catwalk, and three sample ports. Foul air enters the carbon unit through a 16-inch duct near its base, flows up through the activated carbon bed, and exits through the 16-inch duct at the top.

Manually operated dampers on the discharge side of the carbon filter fan allow its flow to be directed either to the carbon filter unit or directly to atmosphere. Bypassing the odor control unit is only done when the unit is down for maintenance.

Wet well exhaust fan. The wet well exhaust fan has equal capacity to the carbon filter fan and draws from the same intake duct; it discharges to atmosphere through the carbon filter bypass line.

Control strategy

Carbon filter fan. The system is started and stopped manually. Normally the odor control system runs continuously. If the carbon filter fan fails a system failure alarm registers.

Wet well exhaust fan. This fan runs anytime the wet well light is switched on. This brief discharge of untreated air is unimportant compared to the safety provided by the extra ventilation for the operator.[1]

1. This is currently locked out in the odor control room

Carbon Filter Fan

Control options

Carbon filter fan. The odor control unit is started and stopped using an OFF/RUN switch, and a RUN light on MCC A. There is also local LOCKOUT/STOP and TEST buttons on the wall of the odor control unit room.

Monitoring the system. To monitor the odor control unit, sniff each of the three sample probes.

Submit samples of the carbon to the South Plant Lab periodically and test that the pH is correct and the carbon is still active.

Alarms

- ODOR CONTROL SYSTEM FAILURE Carbon filter fan (F 330,425) has failed. Indicated by no air flow through the odor control duct.

Power outage

The carbon filter fan will restart automatically when power has been restored. The fan is powered from bus A, the Eastgate feeder.

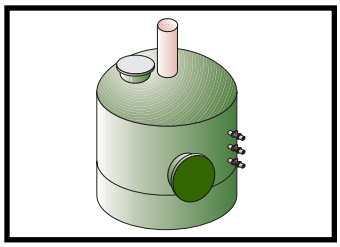
Testing the air flow

To determine if the air flow through the media is adequate, hold a sheet of paper at the duct intake in the wet well room. If the sheet of paper is pulled up and into the intake, then there is enough air flow. Also check the fan's belt to make sure it is moving.

Operating safely

- ALWAYS use a dust mask and wear a hat, gloves, goggles, and a coat that are resistant to caustic chemicals when handling the odor scrubber media, as the media is impregnated with caustic soda (potassium hydroxide).
- NEVER enter the wet well unless at least two operators are present; be careful going down the spiral staircase leading into the wet well.
- BE SURE that the exhaust fan has been operating for at least 3 hours and that the wet well is well ventilated before entering.
- ALWAYS use three people when removing activated, impregnated carbon from the odor scrubber unit.
- NEVER expose the activated, impregnated carbon to heat or open f lame; to do so can cause media bed fires.
- MAKE SURE the fan is off before performing maintenance to the ducting or odor scrubber unit.
- NEVER use any solvents or resins in the scrubber when it is in use. If it becomes necessary to perform maintenance on the scrubber using solvents or resins (for example, for fiberglass repairs), the activated, impregnated carbon MUST be removed to avert a possible fire. All solvents must be purged from the scrubber and ducting before reloading with the carbon media.
- ALWAYS operate the exhaust fan continuously during normal operation to prevent excessive condensation and corrosion inside the wet well and to comply with Department of Ecology regulations.

Changing the carbon. Normally the carbon is changed with the help of a vac-truck. When changing the carbon completely enclosed protective clothing and a respirator must be worn. Wash water must also be locally available for decontamination. Be sure to follow all instructions and safety advice of the carbon supplier.



10.2 Operating the Odor Control System

To prevent odor complaints from the neighbors, the odor control system must be operating constantly and the carbon must be active so that it can adsorb the odors. Check for odors anytime you are at the station. Remember if the wet well light is on, the wet well transfer fan is operating and this fan DOES NOT go through the carbon odor reduction tower (ORT).

Checking the media bed

The activated carbon bed is supported by fiberglass gratings covered by TETKO 5-18-1000 polypropylene mesh. Be careful not to puncture or tear this mesh. If the mesh is damaged, the granular carbon will fall through the holes, blow out the scrubber exhaust port, or block the exhaust duct.

1. **Verify that the media has been tested at least once in the last month.**
   "Sniff" (smell) and "card" tests can also be done by the operator.
   - In the sniff test, open the gas probes, beginning at the top and smell the air over the opening. If the top probe opening has no odor, continue downward opening the other two probes. This test will also show if the media is starting to fail and whether sampling should be stepped up.
   - The card test refers to litmus cards that change from blue to red when the media becomes too acidic.
2. **If the monthly sample was not run, take three samples.**
   Use a carbon thief (from the top, middle, and bottom of the media bed), and forward them to the South Plant Laboratory for analysis. The lab may decide to forward the samples to Westates Carbon for wide spectrum analyses before making any media replacement recommendations.
3. **Check the differential pressure gages for adequate air flow through the media.**
   Maximum differential pressure should not exceed 7 inches water column.If the readings exceed 7 inches water column, remove the odor scrubber unit cover and break up the crust covering the media.

Carbon Test Ports

4. **Verify that the exhaust fan is running.**
5. **Lubricate the odor control equipment, as needed.**

Changing the media

DANGER

When changing the carbon, completely enclosed protective clothing and a respirator must be worn. Wash water must also be locally available for decontamination. Be sure to follow all instructions and safety advice of the carbon supplier.

If the lab determines the media should be changed, remove the used material from the unit with the vac truck.

When the used material has been removed, refill the tank with a fresh "soft pack" batch of activated, impregnated carbon; soft packing promotes air flow through the media.